PART 3: TECHNICAL SPECIFICATIONS

SECTION 00 43 22
UNIT PRICE FORM

1. Should certain additional work be required, or should the quantities of certain classes of work be increased or decreased from those required by the Contract Documents, by authorization of the City, unit prices shall at the option of the City be the basis of payment to the Contractor or credit to the City, for such increase or decrease in the work. The unit prices shall represent the exact net amount per unit to be paid by the Contractor (in the case of addition or increase) or to be refunded the City (in the case of decrease). No additional adjustment will be allowed for overhead, profit, insurance or other direct or indirect expenses of the Contractor or Subcontractors.

2. The unit prices shall include all costs to provide the types of finished work called for including, but not limited to: labor, materials, equipment, delivery, storage, protection, installation, removal & disposal of associated waste and excess material, overhead, profit and insurance. Changes shall be processed in accordance with the provisions of the General Conditions governing changes in the work.

3. Contractor shall submit bill of lading receipts for each delivery of materials to be used for work approved by the Owner for payment by unit price. Bill of lading shall include the date of shipment, material source name and location, contractor name, material description, quantity and project name and address.

4. Refer to Section 321816 – Resilient Sport Surfacing and Section 312000 Earthwork for submittal, material, execution, quantities, measurement and testing requirements.

5. Unit Price Schedule abbreviation definitions

6. UNIT PRICE SCHEDULE

		ADD or DEDUCT
a.	Delaminated Track Surfacing Replacement	$_____/square yard
b.	Synthetic Turf Top Stone	$_____/ton

END OF SECTION

SECTION 024113

SITE PREPARATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

This section is only a portion of the Contract Documents. All of the Contract Documents, including Conditions of the Contract and Division 1 General Requirements, apply to this section.

1.2 DESCRIPTION OF WORK

A. Provide all labor, materials, equipment, and services necessary to complete the work of this Section as specified herein, as shown on the drawings, or both. The Contractor shall coordinate site preparation and demolition activities for each phase of construction.

B. The work of this Section includes, but is not limited to, the following:

1. Staking layout, limits of work and extent of grading
2. Erosion and Sedimentation Control
3. Saw cutting existing pavement
4. Removing asphalt pavement
5. Demolition, removal from the site and legal disposal of all existing above grade and subsurface improvements as indicated on the Drawings and as required by the work of this Contract
6. Protection of existing improvements to remain
7. Temporary protection of adjacent public and private property
8. Permits
9. Rodent Control

1.3 RELATED WORK

A. Carefully examine all of the Contract Documents for requirements that affect the work of this Section. Other specification sections that directly relate to the work of this Section include, but are not limited to, the following:

1. Section 31 20 00 – Earthwork
2. Section 32 12 16 – Asphalt paving
3. Section 32 13 13 - Concrete
4. Section 32 18 16 – Resilient Sport Surfacing
6. Section 32 18 23 – Synthetic Turf
7. Section 32 30 00 – Site Improvements
8. Section 32 90 00 – Planting
9. Section 32 91 00 – Loam and Planting Preparation

1.4 PROJECT CONDITIONS

A. It is hereby understood that the Contractor has carefully examined the site and all conditions affecting work under this Section. No claim for additional cost will be allowed because of lack of full knowledge of existing conditions.

B. Preparation and Workmanship: Except as otherwise specified, site preparation, demolition work and clean up shall be the work of the Contractor. Any item of work not specifically designed to be accomplished by a particular subcontractor shall be considered work of the Contractor.

C. Traffic: Conduct site clearing and demolition operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

D. Protection of Existing Improvements: Provide protection necessary to prevent damage to existing buildings, paving, services and all other improvements indicated to remain in place. Locate and identify existing underground utilities within project limit lines. Provide adequate means of protection of all utilities to remain. The Contractor shall contact "Dig-Safe" at 1-888-344-7233 prior to beginning any excavation work. The Contractor shall be solely responsible for locating all underground utilities prior to the commencement of work. Locations of existing utilities on the site plans are not warranted to show all existing utilities under or above ground. Existing utilities indicated on the site plans are shown only for the convenience of the Owner's representatives.

1. Protect improvements and surfacing on Owner's property.
2. Protect existing track surfacing
3. Protect existing track trench drains
4. Restore improvements damaged during construction to their original condition, as acceptable to the Owner and any agencies having jurisdiction

E. Protection of existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, damaging heat from paving equipment, excess foot or vehicular traffic, or parking of vehicles within tree canopy drip lines. Provide temporary guards, fencing or any other necessary precautions to protect trees and vegetation to remain.

1. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during the course of construction operations.

2. Repair trees and vegetation indicated to remain that are damaged by construction operations, in a manner acceptable to the Architect. Employ a licensed arborist to repair damage to trees and shrubs.

3. Replace trees and vegetation that cannot be repaired and restored to full-growth status, as determined by a licensed arborist. Trees determined to be removed due to damage caused by the work of this project shall be removed and replaced at the Contractor's expense with a quantity of approved tree species that match the total tree caliper surface area of the removed trees as measured 12-inches above original grade. Damage requiring tree removal shall include damage to roots, trunk or branches where protection would have prevented such damage. The extent of damage requiring tree removal shall include any one or more of the following: permanent scaring of tree bark, loss of branches or portions of branches that disfigure the tree character, compaction or material contamination of the root zone.

F. Dust and Pollution Control: Provide dust control for dust generated by the work of this project. Dampen surface as required or use other approved method. Comply with pollution control requirements of the governing authority.

G. Bench Marks: Locate, protect and maintain bench marks, monuments, control points and project engineering reference points.

H. Regulatory Controls: All work within this Section must comply with the requirements of all authorities having jurisdiction.

I. Permits: The Contractor shall be responsible for obtaining all permits required to complete the work of this contract, to provide all coordination and furnish all bonds, assurances and required warranties. As applicable, the Contractor shall be responsible for any/all fees associated with securing of permits necessary for the execution of the work of this contract.

J. Rodent Control: The Contractor shall retain the services of a licensed rodent exterminator to conduct an inspection of the work and laydown areas and report on the presence of rodents and take any necessary measures to eliminate rodent populations prior to start of work. All rodent control to be in place and approved prior to any equipment delivery or demolition.

L. Subsurface conditions: Refer to Section 312000 – EARTHWORK and Appendix A – Existing Field Testing Documents.

PART 2 – PRODUCTS

2.1 TEMPORARY CONSTRUCTION FENCE

A. Temporary Construction Fence shall be six-foot high galvanized steel fence panels on stable, movable footings and include hardware to secure panels together.

2.2 EROSION AND SEDIMENTATION CONTROL

A. Materials for erosion and sedimentation control shall be as described herein.

1. Catch basin filters shall be SiltSack by ACF Environmental 1-800-448-3636 or approved equal. Provide regular flow (40 gal./min./ft.^{2}) or high flow (200 gal./min./ft. ^{2}) as required to provide positive drainage of all contributing areas.

2. Filter fabric: Refer to Section 312000 – Earthwork

3. Straw wattles shall be composed of 100% agricultural straw and wrapped in natural fiber netting that is biodegradable, jute or similar material. Photo-degradable netting is not acceptable. Netting shall have 0.5 inch openings. Ends shall be secured with wire closures and installed in accordance to manufacturer's recommendations.

2.3 RODENT CONTROL

A. Within ten (10) days after Notice to Proceed, submit to the Landscape Architect or Owners Representative a written description of rodent control measures to be used and the areas to be included.

B. Provide the names and background of the licensed rodent exterminator retained to provide any necessary rodent eradication measures prior to the start of work. The licensed rodent exterminator must be approved by the City Director of Inspectional Services.

C. Containers:
1. Use metal or heavy-duty plastic refuse containers with tight fitting lids for disposal of all garbage, or trash associated with food. These containers shall not have opening that allow access by rodents.

PART 3 - EXECUTION

3.1 SITE ENGINEERING /LAYOUT

A. Prior to the start of clearing and excavation operations, lay out and stake the building additions, paved areas, limits of cut and fill and work limit lines for the Architect's review.

B. Promptly upon completion of layout work, and before any clearing or other construction work is begun, the Contractor shall arrange a conference on the site with the Architect to inspect and verify the limits of work areas staked out. The limit of cut and fill shall be clearly marked to determine the extents of tree removal required.

3.2 PROTECTION OF EXISTING IMPROVEMENTS

A. Provide temporary protection to the existing track trench drains and catch basins where shown as detailed on the Drawings and as required where directed by the Landscape Architect in the field.

B. Provide temporary protection to the existing track surfacing where shown as detailed on the Drawings and as required by the Landscape Architect in the field.

C. Provide temporary protection to the existing concrete turf anchor where shown as detailed on the Drawings and as required by the Landscape Architect in the field.

3.3 PROTECTION OF TREES AND SHRUBS

A. Prior to starting any construction work, erect tree protection where shown as detailed on the Drawings and as required where directed by the Landscape Architect in the field.

B. Fill holes, depressions caused by clearing and grubbing operations with fill material and placement conforming to Section 312000 – EARTHWORK as specified for the proposed improvements. Place fill in horizontal layers, 6 inches in loose depth, and compact to the specified density.

C. Without exception, any area cleared for any reason by the Contractor, inside or outside the Limit of Work Line and not otherwise developed shall be loamed and seeded at no additional cost to the Owner.

3.3 PRUNING OF EXISTING PLANT MATERIAL TO REMAIN

A. Within the limit of work lines protect all plant materials to remain as indicated on the Drawings. No such plant materials shall be used as guys or other fastenings.

B. The Contractor shall not cause any damage to trees to remain. If in order to perform excavation work, it becomes necessary to cut roots of plants to be saved, such roots shall be neatly cut after consulting with an Arborist and notifying the Architect.

3.4 STRIPPING AND STOCKPILING TOPSOIL

A. Prior to the start of General Excavation, strip all topsoil and subsoil from within areas to be re-graded. Do no stripping without clear understanding of the existing soil, planting and site conditions to be preserved and limits of existing topsoil stockpile and stripped areas.

B. All topsoil encountered during the stripping operations, regardless of depth, shall be removed and stockpiled on the site as shown on the Drawings or where directed by the Architect or removed from the site if the Contractor determines there is adequate topsoil to complete the work and after approval by the Architect. Areas having greater depths of topsoil than indicated on boring data sheets or reasonably anticipated shall be stripped of all such material and fill shall be used to bring such areas to the rough grade level. Stones over six inches and tree roots over two inches in any

dimension shall be removed from loam before stockpiling. All other stripped soil that can be classified as fill as defined in Section 312000 - EARTHWORK, shall be stockpiled for reuse in rough grading. This material shall be stripped separately from the topsoil. Topsoil and organic materials due to be stripped are as follows:

C. The Contractor shall so control his topsoil stripping operation so that it does not become contaminated with subsoil or other earth materials; the Contractor shall use machinery suitable for achieving this result.

D. Stripped topsoil shall be disposed of.

3.5 ABOVE AND BELOW GRADE IMPROVEMENTS

A. Remove and legally dispose of all existing above and below grade improvements necessary to permit construction of the Project including but not limited to pipes, tanks, concrete slabs, castings, curbing, walls, fencing, signage and any and all other improvements inside or outside the contract limits except items indicated on the Site Preparation Plan to be preserved and protected or removed and salvaged. Remove walls and other obstructions to a depth of at least 2 feet below finished grades and as required to construct the subsurface improvements of this project.

1. Contractor shall remove and legally dispose (off-site disposal) of the existing synthetic turf and associated infill in accordance with Item 3.5 of this section, including proper removal and disposal of any adhesives or fasteners used to secure the material to the edges.
2. Refer to Appendix-A Existing Field Testing Documents for description of synthetic turf and infill materials

B. Abandonment, relocation, partial removal or complete removal of certain existing underground and above ground utilities including, but not limited to pipes, tanks, castings, conduits, electrical wiring and poles shall be performed as indicated on the Drawings.

3.6 DISPOSAL OF WASTE MATERIALS

A. Removal from Owner’s property: Remove all waste materials from Owner’s property in timely and responsible manner and legally dispose of off-site. Accumulation is not permitted. Maintain disposal routes clear, clean and free of debris. Dumping and / or burning of material on site will not be permitted.

3.7 CLEAN UP

A. Keep pavements and areas adjacent to and leading from the site, clean and free of mud, dirt and debris.

B. At completion of the work of this Section, remove materials generated by site clearing. Do not spill or disperse debris on the site. Leave the site in a safe and clean condition acceptable to the Architect.

END OF SECTION

SECTION 312000
EARTHWORK

PART 1 - GENERAL

1.01 General Requirements

A. The conditions of the Contract, including Division 00 and Division 01, apply to the work under this Section.

B. The Contractor shall prior to any removal of surplus fill, excavated material, or debris from the site, furnish written evidence satisfactory to the owner or owner's representative that he has an approved dumping location for debris and/or spoil from his/her excavation activities.

1.02 Work Included

A. Provide all labor, equipment, implements and materials required to furnish, install, construct and perform Earthwork as shown on the Drawings and as specified herein.

1. Excavating, filling, trenching and backfilling of all descriptions required for the construction of pavements, safety surfaces, equipment, site improvements, utilities, filling voids left by hardscape and plant removals, and all specialties. Provide all additional fill materials as required and specified herein.

2. Pumping and/or bailing necessary to maintain excavated spaces free from water from any source whatsoever.

3. Dust control.

4. Provide graded materials, as specified, for fills, base courses and backfills as required.

5. Rough grading.

6. Perform all compaction of fill materials as hereinafter specified.

7. Obtain all required permits, licenses and approvals of appropriate municipal and utility authorities prior to commencing work, pay all costs incurred therefrom.

B. Examine all other Sections of the Specifications and all Drawings for the relationship of the work under this Section and the work of other trades. Cooperate with all trades and all departments of the City of Somerville and coordinate all work under this Section therewith.

C. The following related items are included under the Sections listed below.

1. Section 02 41 00 – Site Preparation
2. Section 31 12 16 – Asphalt Paving
3. Section 32 13 13 – Concrete
4. Section 32 18 23 – Synthetic Turf
5. Section 32 30 00 – Site Improvements
6. Section 32 90 00 – Planting
7. Section 32 91 00 – Loam and Planting Preparation

1.03 Submittals

A. Submit certified gradation test data for borrow materials a minimum of one week prior to delivery to the site.

B. Provide 50-pound samples of each material to a qualified laboratory for moisture density testing a minimum of one week prior to delivery to site.

C. Compaction test of subbase materials after installation and compaction and before surface material is installed.

1.04 Laws, Ordinances, Permits and Fees The Contractor shall:

A. Give necessary notices, obtain all permits and pay all governmental taxes, fees and other costs in connection with this work, file all necessary plans, prepare documents and obtain all necessary approvals.

B. Obtain all required certificates of inspection for this work and deliver same to the Landscape Architect before request for acceptance and final payment for the work.

C. Include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings (in addition to contract drawings and documents) in order to comply with all applicable laws, ordinances, rules and regulations of the City of Somerville and the Commonwealth of Massachusetts, whether or not shown on the Drawings and/or specified.

D. The Contractor shall provide a temporary sidewalk whenever a sidewalk is closed because of the construction. This temporary sidewalk must be at the same level as the existing closed sidewalk and it must be visually partitioned off from the street and work area. The Contractor shall so conduct their operations as to interfere as little as possible with roads, driveways, alleys, sidewalks, or other nearby facility.

1.05 Definitions

A. The following related items are included herein and shall mean:

1. S.S.H.B. - Standard Specifications for Highways and Bridges, the Commonwealth of Massachusetts, Department of Transportation,latest edition

2. A.S.T.M. - American Society for Testing and Materials

3. A.A.S.H.T.O. - American Association of State Highway and Transportation Officials

B. “Excavation” consists of removal of material encountered to subgrade elevations indicated and disposal of materials removed.

C. “Finished grades” as used herein shall mean the required final grade elevations indicated on the Drawings. Spot elevations shall govern over proposed contours. Where not otherwise indicated, project site areas shall be given uniform slopes between points for which finished grades are indicated or between such points and existing established grades.

D. “Base Course” as used herein is the placed and compacted material immediately below the finish grade material to the thickness indicated on the Drawings.

E. “Subgrade” as used herein means the naturally occurring or placed and compacted material below the base course.

F. “Trench Excavation” is defined as an excavation of any length where the width is less than twice the depth and where the distance between the pay lines does not exceed ten feet.

G. “Open Excavation” is defined as all other excavation.

H. “Unauthorized excavation” is defined as excavation beyond approved measurement lines.

I. “Unsuitable materials” are soils containing organic matter, materials subject to attack from termites, materials subject to decomposition, soils too wet to be stabilized, frozen materials and existing materials that do not satisfy the product specification herein. Weak or soft material resulting from any of the Contractor’s operations shall not be considered “unsuitable material”.

J. “Excess material” is any excavated material that is not needed for the construction of project elements. The removal of excess material from the site shall be included in the Base Bid Contract.

K. Rock excavation shall be defined as solid, continuous rock or concrete mass, unable to be removed without mechanical measures and larger than 1 cubic yard in size. All other rock shall be unclassified excavation included in the contract bid price.

1.06 Bench Marks and Engineering

A. Lines and grade work in accordance with Drawings and Specifications shall be laid out by a registered Civil Engineer or registered Surveyor employed by the Contractor. The Contractor shall establish permanent bench marks, to which access can easily be had during the progress of the work. The Contractor shall maintain all established bounds and bench marks and replace, as directed, any which may be disturbed or destroyed. The selection of the registered Civil Engineer or Surveyor shall be approved by the Landscape Architect.

B. The Contractor shall submit written confirmation of dimensions and elevations on the ground and report any discrepancies immediately to the Landscape Architect. Such confirmation shall bear the Engineer's registration stamp. Any discrepancies not reported prior to construction shall not be the basis of claims for extra compensation.

C. The General Contractor shall not commence any excavation or construction work, until the Landscape Architect's verification has been received and approved by the Official.

1.07 Subsurface Information

A. The Owner assumes no responsibility for the Contractor's failure to make his own site investigation and makes no warranty regarding the character of the soil or subsurface conditions which may be encountered during the performance of the work.

B. Refer to Appendix A for pre-bid testing data on the existing synthetic turf base stone.

1.08 Finished Grades

A. The words "finished grades" as used herein mean the required final grade elevations indicated on the Drawings. Where not otherwise indicated, site areas shall be given uniform slopes between points, for which finished grades are shown, or between such points and existing grade except that vertical curves or roundings shall be provided at abrupt changes in slope.

1.09 Grades and Elevations

A. The Drawings indicate, in general, the alignment and finished grade elevations. The Landscape Architect, however, may make such adjustments in grades and alignment as are found necessary in order to avoid interference and to adapt the grading to other special conditions encountered.

1.10 Work in the Public Ways

A. Notify the appropriate municipal officials at least seven calendar days in advance of commencing any work in the public ways to obtain all required permission to perform this work. Perform all work in the public ways in a manner required by the municipal authorities.

B. Should there be any conflict between requirements specified in the Contract Documents and those of the City of Somerville, the municipal requirements shall govern.

C. Do not close or obstruct any streets or sidewalks unless and until they have been discontinued by the appropriate municipal authority or unless and until he shall have first secured all necessary or other permits therefor. No materials whatsoever shall be placed or stored in the streets. Conduct all operations to interfere as little as possible with the use ordinarily made of roads, driveways, sidewalks, or other facilities near enough to the work to be affected thereby.

1.11 Disposition of Existing Utilities

A. Active utilities existing on the site shall be carefully protected from damage and relocated or removed as required by the work. When an active utility line is exposed during construction, its location and elevation shall be plotted on the Record Drawings and both the Landscape Architect and the Utility Owner notified in writing.

B. Inactive or abandoned utilities encountered during construction operations shall be removed, plugged or capped in accordance with procedures of relative utility company or agency. The location of such utilities shall be noted on the Record Drawings and reported in writing to the Landscape Architect.

C. Active utility lines damaged in the course of construction operations shall be repaired or replaced as determined by the Landscape Architect without additional cost to the Owner.

D. Notify the Owner at least three (3) days in advance of the proposed time for shutting down or interrupting utilities or services which may affect operation of adjoining properties. Unless otherwise authorized by the Owner, schedule such interruptions on weekends, holidays, or before or after Owner's normal working day. In no case shall any services or utilities be interrupted prior to notification and authorization by the Owner.

1.12 Protection

A. All rules and regulations governing the respective utilities shall be observed in executing all work under this Section. All work shall be executed in such a manner as to prevent any damage to existing streets, curbs, paving, service utility lines, structures and adjoining property. Monuments and bench marks shall be carefully maintained and, if disturbed or destroyed, replaced as directed.

B. The Contractor shall perform the installation, maintenance and removal of all sheet piling, shoring and bracing required for the protection of all items of this Contract affected by the work of this Section.

C. The Contractor shall furnish all facilities and materials necessary to prevent the earth at the bottom of excavation from becoming frozen or unsuitable to receive footing or other load bearing units.

D. The work of this Section shall be performed in such a manner as to cause no interference with access by the Subcontractors or other Contractors to all portions of the site as is necessary for the normal conduct of their work.

E. Protect all areas to remain undeveloped outside the Contract limit lines. Should these areas be damaged, the Contractor shall restore them to the satisfaction of the Landscape Architect and Owner at no additional cost to the owner. This includes the repairing and replacement of all damaged conditions such as plant materials and similar items.

1.13 Samples and Testing:

A. All fill material and its placement shall be subject to quality control testing. Contractor will submit the name of a qualified laboratory to perform test on materials, for Approval by Landscape Architect. The Contractor will pay for all costs of testing. Test results and laboratory recommendations shall be available to the Landscape Architect. Submit one test for each material source proposed for use.

B. Provide samples of each fill material from the proposed source of supply. Allow sufficient time for testing and evaluation of results before material is needed. Submit samples from alternate source if required. The Landscape Architect will be sole and final judge of suitability of all material.

C. The laboratory will determine maximum dry density and optimum water content in accordance with ASTM D1557, Method D and the in-place density in accordance with ASTM D1556.

D. Sampling and testing material delivered to the site shall be performed to ensure material conforms to approved submittals. Materials in question may not be used, pending test results. Compaction tests shall be performed on placed fill materials. Materials that do not conform to the specified physical or performance requirements shall be removed and replaced with acceptable materials at the Contractor's expense.

F. Cooperate with laboratory in obtaining field samples of in-place materials after compaction. Furnish incidental field labor in connection with these tests.

H Top stone material and existing synthetic turf stone base at Dilboy Stadium shall be field tested for permeability prior to installation of the shock pad in accordance with ASTM D 3855, Method for Infiltration Rate of Soils Using Double-Ring Infiltrometer. Refer to Appendix A for pre-bid baseline testing.

PART 2 – PRODUCTS

2.02 Fill Materials

A. Ordinary Fill

1. All material to be placed where the Specifications or Drawings call for Ordinary Fill shall be well-graded, natural, inorganic mineral soil approved by the Landscape Architect and shall have the physical characteristics of soils designated as group A-1, A-2-4, or A-3 under AASHTO-M145.

2. Ordinary Fill shall be free of organic or other weak or compressible materials, of highly plastic clays, of all materials subject to decay, decomposition or dissolution, of cinders or other materials which will corrode piping or other metal, of frozen materials, and of stones larger than 6 inches.

3. Ordinary Fill shall be of such nature and character that it can be spread and compacted to the specified density in a reasonable length of time.

4. Soil for use as Ordinary Fill shall contain no more than 35 percent by weight passing the No. 200 sieve.

5. It shall have a maximum dry density of one hundred pounds per cubic foot.

B. Gravel Borrow

1. All paving shall be installed over compacted graded gravel; all footings and all voids left from equipment removal shall be filled with compacted graded gravel.

2. All gravel fill shall meet the specifications of M1.03.1 “Processed Gravel for Subbase” in S.S.H.B. Submit sample and test results for approval.

Sieve Size	**Percent Finer by Weight**
2-inch	100
1/2-inch	50-85
No. 4	40-75
No. 50	8-28
No. 200	0-8

C. Crushed Stone (Drainage Stone):

1. Drainage stone, or crushed stone, shall be 3/4” and (except where other size indicated on the Drawings) clean, angular stone of a hardness suitable for use in structural applications. 3/4” stone shall comply with M2.01.4 and 1/2” shall

comply with M2.01.5 in S.S.H.B.

D. Synthetic Turf Base Materials

1. Top drainage stone, if required to supplement the existing drainage stone directly beneath the synthetic turf and shock pad shall be payable by unit price per Section 00315. Top drainage stone shall consist of clean, hard, crushed aggregate that is angular and durable derived from a stone quarry free of all deleterious materials. Gradation of sample provided for testing and approval shall be within the following range:

U.S. Sieve No.	Percent Finer by Weight
1/2”	100
3/8”	85-100
1/4”	75-100
No. 4	60-90
No. 8	35-75
No. 16	10-55
No. 30	0-40
No.50/60	0-15
No.100	0-8
No.200	0-2

2. Refer to Appendix A for testing data. Existing stone base was tested in 2 locations at 45-73 inches per hour. After laser grading, the existing stone base along with any supplemental top stone shall exceed 40 in/hr (3.5×10^{-2} cm/sec)
Permeability of top stone layer > 40 in/hr (2.0×10^{-2} cm/sec)
Porosity of both stones > 25%(When stone is saturated and compacted to 95% Proctor)

3. To ensure structural stability: $D_{60}/D_{10} > 5$ and $1 < \frac{D^2_{30}}{D_{10} D_{60}} < 3$
Fragmentation must be 100%.

4. Laboratory test: ASTM D 2434 Permeability of Granular Soils (Constant Head)
Field test: ASTM D 3855, Method for Infiltration Rate of Soils Using Double- Ring Infiltrometer

5. Depending on the type of rock present in the crushed stone mix, other mechanical characteristics might be necessary for approval

6. Soft aggregate materials such as sedimentary rock sources are not acceptable. Questionable materials shall be evaluated using a sulfate soundness test (ASTM C-88) and LA Abrasion Test (ASTM C-131) and shall be within the following criteria:

Test Method	Criteria
Sulfate Soundness (ASTM C- 88)	Not to exceed 10% loss
LA Abrasion (ASTM C-131)	Not to exceed 20% loss

PART 3 - EXECUTION

3.01 Grades and Elevations

A. Establish the lines and grades in conformity with the Drawings. Establish and maintain suitable stakes or batters at points where spot elevations are given on the Drawings and at any other points to be graded as directed by the Landscape Architect. Maintain sufficient reference points at all times during construction to properly perform the Contract installation.

3.02 Excavation

A. Prior to any excavation, contact DIG-SAFE at 1-888-344-7233 to identify subsurface utilities within the work area.

B. General

1. Excavate all material to the elevations, dimensions and form as shown on the Drawings and as specified for the construction of site improvements and other structures necessary for the completion of the utilities and site work. All unsuitable materials within the indicated and specified limits shall be excavated and removed at no additional cost to the contract. Any quantities involving an extra or other adjustment of the Contract Price shall be subject to measurement verification and approval by the Landscape Architect prior to the excavation and removal of such materials. Unsuitable materials shall include the following:

a. Utility structures, building foundations and other man-made structures.

b. Peat, organic silt and other organic materials subject to decomposition, consolidation or decay.

c. Miscellaneous fill including cinders, ash, glass, wood, and metal.

2. In general, the Contractor shall be permitted to use machine excavation except for the final six (6) inches under footings, foundations, utility lines and structure, which shall be hand work.

3. If any part of the excavation is carried through error beyond the depth and dimensions indicated on the Drawings or specified herein, or if the foundation soils are disturbed by dewatering or other construction operation, the Contractor shall, at his own expense, refill with structural fill compacted to ninety-five (95) percent of the maximum dry density at optimum moisture content.

4. When excavation has reached the prescribed depth, the Landscape Architect shall be notified and will make an inspection of the condition and approve the placing of fill material.

5. The Contractor shall obtain from the proper authorities locations of all utilities within the scope of this work so that there will be no damage done to such utilities. Neither the Owner nor the Landscape Architect will be responsible for any such damage, and the Contractor shall restore any structure or utility so damaged without additional compensation. Attention is called to that fact

that there are electric lines, and other utilities in certain locations within and adjacent to the sites. Written notifications to the appropriate utility agencies shall be made at least ten (10) days prior to the commencement of any work.

6. Wherever culverts, sewers, drains, manholes, catch basins, catch basin connections, water mains, valve chambers, utility tunnels, gas pipes, electric and telephone conduits, house service connections of any other underground constructions are encountered in excavating for utilities or any other site work, they shall be protected and firmly supported by the Contractor, at his own expense, until the trench is backfilled and the existing structures are made secure. Injury to any such structures caused by or resulting from the Contractor's operations shall be repaired at the Contractor's expense. The authority having charge of any particular underground structure shall be notified promptly of damage to its structure.

7. Excess material - Suitable excavation material which is allowable for fill and backfill shall be separately stockpiled as directed by the Landscape Architect. All surplus fill other than that required to complete the intent of the Contract shall become the property of the Contractor and shall be legally disposed of off the property. All excavated materials which, in the opinion of the Landscape Architect are not suitable for fill and backfill shall be removed and legally disposed of off the property.

8. Any unsanitary conditions encountered, such as broken sewer mains or uncovered garbage, shall be corrected or removed entirely as directed by the Landscape Architect.

C. Excavation for Site Improvements.

1. Excavate to the lines and grades shown on the Drawings and as specified to obtain the subgrades for the site improvements.

2. Existing service and utilities encountered shall be immediately repaired, protected and maintained in use until relocation of same has been completed or to be cut and capped where directed or be prepared for connection when so required.

3.03 Subgrade Preparation and Protection

A. General Requirements

1. All subgrade areas shall be made ready for fill by removal of all organic material, unsuitable soils and deleterious materials to firm natural ground as directed by the Landscape Architect.

2. Scarify, spot-fill, or otherwise treat the surface of areas to receive fill as necessary to remove holes, depressions, ruts, hummocks, or other uneven features.

B. Proof Rolling Subgrades

1. Prior to placement of fill, or bottom filter fabric where shown on drawings, proof roll natural ground by making a minimum of two passes with approved compaction equipment. Proof rolling may be waived by the Landscape Architect where excessively wet or saturated subgrade conditions are encountered.

3.04 Protection

A. Protect open excavations with fencing, warning lights and other suitable safeguards. No open excavation shall be left without proper barriers and other devices necessary for public safety.

B. Comply with local safety regulations or, in the absence thereof, with the provisions of the Manual of Accident Prevention in Construction of the Associated General Contractors of America, Inc. and O.S.H.A.

C. Frost Protection - Make no excavation to the full depth indicated when freezing temperature may be expected unless the footing or slabs can be poured immediately after the excavation has been completed. Protect the bottoms as excavated from frost, if placing of concrete is delayed, with straw, tarpaulins or temporary heat until footings or slabs poured and backfill is placed.

D. Any ditching required to keep the site free from water during construction is the responsibility of the Contractor.

3.05 Fill and Compaction

A. Compaction Equipment and Density Requirements

1. Compaction equipment and methods shall be sufficient to achieve the specified densities and provide an evenly dense and compacted thickness throughout without abrading the aggregate base or increasing the percentage of fine particles. All ruts shall be filled, the surface even and compacted to the density called for. The Landscape Architect retains the right to disapprove the use of any equipment that does not meet the above Specifications or perform the work as intended. Any modifications of equipment or method must be approved by the Landscape Architect.

2. Fill material under pavements and structures shall be compacted to ninety-five (95) percent of maximum density(s) determined by A.S.T.M. Test Designation D-1557, Method D or A.S.T.M. D-1556. For fill to 30” depth within seeded and planted areas compact portion of fill for planting to at least 80 percent but not more than 90 percent of the material’s maximum dry Proctor density

   a. Fill material under synthetic turf shall be compacted to. 92% min - 95% max of maximum density(s) determined by A.S.T.M. Test Designation D- 1557, Method D or A.S.T.M. D-1556

3. Refer to 1.13 in this Section for testing requirements.

B. Placing Fills and Compacting

1. Notify the Landscape Architect when excavation is ready for inspection. Filling and backfilling shall not be started until conditions have been approved by the Landscape Architect.

2. Fill material shall be placed in horizontal layers not exceeding six (6) inches. Each layer shall be compacted to the percentage of maximum dry density specified for the particular type of fill and at a water content equal to optimum dry density and optimum water content shall be as specified herein.

3. Where water content of the fill must be adjusted to meet this Specification, the fill shall be thoroughly disked to insure uniform distribution of any water added.

4. Areas to be filled or backfilled shall be free of construction debris, refuse, compressible or decayable materials and standing water. Do not place fill when materials or layers below it are frozen.

5. In confined areas adjacent to footings and foundation walls and in utility trenches, the fill shall be compacted with hand-operated vibration tampers. The maximum lift thickness shall be four (4) inches. The degree of compaction attained shall be equivalent to that attained in the adjacent open areas where heavy rolling equipment is used. Any areas which subsequently settle shall be refilled to true subgrade and properly compacted.

3.06 Grading

A. Do all grading required for the work including shaping, trimming, rolling and finishing of the surface of the subgrades for all surfaces. All ruts shall be eliminated. Grading for subgrades for paved areas shall be finished at the required depth below and parallel to the proposed surface within 1/4" in 10'-0" tolerance.

B. If, during the progress of rough grading work, any water pipe, sewer, conduit, drain, or other construction is damaged as a result of operations under this Contract, the Contractor shall repair all such damage at no additional cost to the Owner and restore work to its original condition.

C. Do all other cutting, filling and rough grading to the lines and grades indicated on the Drawings. Grade evenly to the finished grades shown on the Drawings. No stone larger than 2" in largest dimension shall be placed in upper 6" of fill.

D. Complete grading operations after site improvements are constructed, and all materials, rubbish and debris removed from the site. Leave subgrade for planting clean at required grades. Provide sufficient grade staking to witness correct lines and grades, as determined by the Landscape Architect.

F. The surface of the top stone layer of the existing synthetic turf stone base shall be re-graded using GPS and dual target laser grading technology to achieve the grades indicated on the grading plan and surface planarity at the tolerances specified herein without exposing the larger aggregate in the bottom stone layer of the existing base.

G. Excess material generated from the laser grading operation shall be removed and disposed at the Contractor’s expense as defined herein.

H. Prior to final laser grading, furnish and install additional top stone per Section 00315 Unit Price Form, if required to achieve the grades indicated on the grading plan.

I. Upon completion the base, the Contractor shall retain a 3rd party testing agency acceptable to the Owner to perform planarity and infiltration testing on the base to ensure it meets the surface tolerances specified herein and drains at a rate of not less than 40 inches per hour.

J. Tolerances

Area	Max Grading Tolerance +/-
1. Subgrade in landscaped areas prior to placement of loam	1/2"
2. Gravel base under pavement	1/4” in 10’
2. Top Stone under synthetic turf	3/16” in 10’

3.07 MAINTENANCE

A. Protect graded areas from traffic and erosion. Repair and re-establish grades in damaged areas. Re-compact, as necessary. Maintain erosion controls as required.

B. Maintain synthetic turf stone base moisture content during installation of the shock pad and synthetic turf to protect and preserve the base stability and surface planarity.

C. Where settling is measurable or observable, remove surface improvements, add fill material, compact and replace surface improvements. Restore appearance to eliminated evidence of patching or repair.

END OF
SECTION

SECTION 32 12 16
ASPHALT PAVING

PART 1 - PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions, Division 0 and Division 1, General Requirements, apply to the work of this Section.

1.02 DESCRIPTION OF WORK

A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to furnish and install ASPHALT PAVING, as indicated on the Contract Documents and as specified herein.

B. The work of this Section includes, but is not limited to the following:

1. Gravel base course construction
2. Hot mix asphalt paving
3. Walkway paving
4. Patching and resurfacing disturbed paved areas

1.03 RELATED WORK

A. Carefully examine all the Contract Documents for requirements that affect the work of this Section. Other specification sections that directly relate to the work of this Section include, but are not limited to the following:

1. Section 02 41 00 – Site Preparation
2. Section 31 20 00 - Earthwork
3. Section 32 13 13 – Concrete
4. Section 32 18 16 – Resilient Sport Surfacing
5. Section 32 18 23 – Synthetic Turf
6. Section 32 30 00 – Site Improvements
7. Section 32 90 00 – Planting
8. Section 32 91 00 – Loam and Planting Preparation

1.04 SUBMITTALS

A. At least 30 days prior to intended use, submit material certificates signed by material producer and Contractor indicating that products comply with requirements. Provide master mix formula for all bituminous concrete specified in this Section, listing quantities and pertinent ingredient properties for review and approval. Submit product data for traffic marking paint.

B. Submit aggregate samples for review and approval.

C. Do not order materials until Architect’s approval of mix formula has been obtained. Delivered materials shall closely match the approved samples.

D. Submit product data for traffic marking paint.

E. Submit samples of Color Surfacing for Pavement Graphics.

1.05 PROJECT CONDITIONS

A. Weather: Perform work only when existing and forecasted weather conditions are within the limits established by referenced standards. Perform work only when ambient temperature is forecasted to be at least 50-degrees Fahrenheit and when temperatures have not been below 35-degrees Fahrenheit for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess amount of moisture or is in a frozen state.

B. Asphalt paving shall not be applied until the finished compacted gravel base has been tested and approved. A delay in paving after the gravel base is tested and approved may require recompaction and testing at no additional cost to the Owner.

C. Construction methods, transportation and delivery of mixtures, spreading, finishing, compaction joints, etc. shall conform to Section 460 of the Massachusetts Department of Transportation Standard Specifications for Highways and Bridges unless otherwise specified herein.

D. Substrates: Proceed with work only when substrate construction and penetrating work is complete and base is dry.

E. Traffic Control: Maintain access for vehicular and pedestrian traffic as required and for other construction activities.

F. Grade Control: Establish and maintain required lines and elevations.

1.06 REGULATORY REQUIREMENTS

A. Strictly comply with applicable codes, regulations and requirements of authorities having jurisdiction.

1.07 QUALITY ASSURANCE

A. Bituminous concrete shall be prepared, mixed, transported, placed, compacted and finished in accordance with the requirements set forth in the latest edition of the “Standard Specifications for Highways and Bridges” (hereinafter referred to as “SSHB”), as published by the Massachusetts Department of Transportation.

1.08 TESTING

A. During the placing and rolling operation, repeated checks shall be made to ascertain the correct rate of application to provide the required compacted thickness

B. If the average thickness is deficient from the specified thickness by one quarter (1/4) inch or more, the extent of the deficient area shall be corrected at the Contractor’s expense.

C. Upon completion of testing, the Contractor shall properly fill all test holes by compacting a fine aggregate bituminous concrete for the full depth of the core. The finished surface shall be smooth.

1.09 COORDINATION

A. This Contractor shall coordinate with all other trades especially grading, curb installation, electrical and plumbing contractors, through the General Contractor in order to prevent covering up unfinished or uninspected work and loss of time or labor by mis-scheduling and to assure the steady progress of all work of the Contract. Any rework shall be done at no cost to the Owner.

1.10 LAYOUT AND GRADES

A. A Registered Land Surveyor or Registered Professional Engineer employed by the Contractor shall lay out all lines and grade work in accordance with the Contract Documents.

1.11 DISTURBING EXISTING PAVEMENT DURING CONSTRUCTION

A. Existing paved areas shall be protected from damage by construction activities to the extent possible. Where sections of the finished paved areas have to be removed, the edges shall be saw cut in all cases and patched.

B. Existing finished paved areas that require extensive cutting and patching or have become damaged and cannot be satisfactorily repaired by cutting and patching shall be resurfaced. These resurfaced areas shall be large enough to be applied by paving machines. Shape of these resurfaced areas shall be near and in rectangular patterns or shall conform to the shape or edges of other adjacent surface improvements. Edges of resurfaced areas shall be saw cut and existing pavements shall be removed from a distance of two feet into areas to be resurfaced, so that now pavement can neatly blend into existing pavement showing no joints or imperfections. If the gravel base course has been disturbed, the Contractor shall remove the disturbed material, repair the existing gravel base and apply a new binder course as specified herein.

C. All paving beyond the project's property line shall be in accordance with the requirements of the authority having jurisdiction. Provide traffic control for any work within the Town's Right-of-Way.

PART 2 - PRODUCTS

2.01 GRAVEL BASE COURSE

A. Subgrade preparation and gravel base course shall furnished and installed as specified under 31 00 00 Earthwork. Starting Asphalt Paving work specified herein shall constitute acceptance of the base course conditions. Any defects in work resulting from such conditions shall be corrected under this Section 31 12 16 Asphalt Paving, at no additional cost to the Owner.

2.02 ASPHALT PAVING MATERIALS AND PRODUCTS

A. Coarse Aggregates: Provide clean, sound, angular crushed stone, crushed gravel, complying with ASTM D 692-88.

1. Use of RAP the binder course and for asphalt driveways, parking lots and walkways shall be limited to a maximum of 20% in the binder course and 10% in the top course provided that the end product is in conformance with the designated job-mix formula. For any bituminous mixture containing RAP, the Contractor shall submit in addition to the Job-Mix formula, the amount and type of asphalt modifier to be added to the mixture to restore the asphalt properties of the RAP to a level that is consistent with the requirements for new asphalt.

B. Fine Aggregate: Provide sharp-edged natural sand or sand prepared from stone, gravel or combination thereof, complying with ASTM D 1073.

C. Bituminous material for tack coat shall be one of the following:

1. Cut-back asphalt (rapid curing type) conforming to AASHTO M81, Grade RC-70 or

2. Emulsified asphalt rapid-setting type conforming to AASHTO M140, Grade RS-1

D. Bitumen asphalt cement for the mixture shall conform to SSHB M3.01.0 and AASHTO M 226, Table 2 with the additional requirement of Ductlity at 60 degrees Fahrenheit.

Bituminous crack sealer shall be a hot-applied bituminous sealer conforming to Fed. Spec. SS-S-1401.

2.03 ASPHALT PAVING MIXES

A. Provide Class I Bituminous Concrete Pavement, Type I-1 in compliance with Section 460, Paragraph 460.40, SSHB and Article 2.2 ASPHALT PAVING MATERIALS AND PRODUCTS.

1. Binder Course and Top Course shall conform with the Job-Mix Formula given in Section M, paragraph M3.11.03, SSHB

2. The Binder Course shall consist of one lift of Binder Course asphalt paving to thickness as shown on the Contract Documents. RAP content shall not exceed 20%. The aggregate for the binder course shall conform to the following gradation requirements:

SIEVE SIZE	PERCENT PASSING
1”	100
3/4”	80 – 100
1/2”	55 – 75
#4	28 – 50
#8	20 – 38
#30	8 – 22
#50	5 – 15
#200	0 – 5
Bitumen % of mix	4.5 – 5.5

3. The Top Course for driveways, parking lots and walkways shall consist of one lift of Top Course asphalt paving to thickness as shown on the Contract Documents. RAP content shall not exceed 10%. The surface tolerance after completion shall be 3/16 inch when measured in any direction with a 10 ft. straightedge. The aggregate for the top course shall conform to the following gradation requirements:

SIEVE SIZE	PERCENT PASSING
5/8”	100

1/2”	95 – 100
3/8”	80 – 100
#4	50 – 76
#8	37 – 54
#30	17 – 29
#50	10 – 21
#200	2 – 7
Bitumen % of mix	5.5 – 7.0

PART 3 - EXECUTION

3.01 GRAVEL BASE COURSE

A. Subgrade preparation and gravel base course construction shall be performed in accordance with 31 20 00 Earthwork to meet the grades indicated on the Drawings and obtain a foundation of uniform bearing surface.

3.02 INSTALLATION OF ASPHALT PAVING

A. Preinstallation examination required: The Installer of asphalt paving shall examine the sub base and all related work, and the conditions under which this work is to be performed and notify the Contractor in writing of all deficiencies and conditions detrimental to the proper completion of their work. Beginning work means Installer accepts substrates, previous work, and conditions.

B. Reference Standards: Install asphalt concrete in strict compliance with Sections 460.60 through 460.68 of the State Standard Specifications, except where more restrictive requirements are specified.

C. Subbase Inspection: Do necessary grading in addition to that specified under Section 31 20 00 Earthwork to bring sub-grade to required grades and sections for bituminous pavement base course construction. Tamp traces of trenches. Remove spongy and otherwise unsuitable material and replace with approved material. Loosen exceptionally hard spots and recompact. Take every precaution to obtain a foundation of uniform bearing strengths. Any defects in this work shall be corrected under this Section at no additional cost to the Owner.

D. Gravel Base Course Preparation: shall consist of approved gravel fill and placed on approved subgrade to the depth indicated and as specified under Section 31 20 00 Earthwork. The surface of the gravel base shall be shaped to the cross section of the pavement. The start of work under this Section shall constitute acceptance of the foundation conditions to which this work is to be applied.

1. The gradation shall conform to Gravel Borrow as specified in Section 31 20 00 Earthwork. Gradation shall be determined by a mechanical wet sieve analysis and in accordance with ASTM D-422.

2. The gravel shall be spread in layers from self-spreading vehicles or with power graders of approved types, or by hand methods upon the prepared subgrade. The

gravel shall be compacted to not less than 95-percent of the maximum dry density of the material as determined by the Method of Test for ASTM Designation D - 1557, Method D. Grading and compaction shall continue until the surface is even and true to the proposed lines and grades within a tolerance of 3/8-inch above or below the required cross sectional elevations and to a maximum irregularity not exceeding 3/8-inch under a ten foot line longitudinally. Any specific area which after being rolled, does not form a satisfactory, solid foundation shall be removed, replaced and recompacted. The gravel shall be spread and compacted in layers not exceeding 6-inches in compacted thickness. The Contractor shall furnish, set and maintain all line and grade stakes necessary to guide the automated grade control equipment.

3. Contractor shall maintain the gravel base course in an acceptable condition, protected from traffic, erosion and other elements until the asphalt paving is placed.

4. After the subgrade and /or existing pavement surfaces have been prepared as specified herein, the Contractor shall check all frames, covers, grates, water valve boxes and all miscellaneous castings that are located in the proposed pavement area to insure that all such items have been accurately positioned and set to the proper slope and elevation. All covers and grates shall be set flush with the required finished pavement surface. No depressions or mounds will be permitted in the pavement to accommodate inaccuracies in the setting of these appurtenances.

5. For reclaimed base course requirements refer to Section 31 10 00 – Site Clearing and Preparation.

E. Tack Coat: Tack coat shall be applied to previously paved, hardened surfaces. Apply uniformly by mechanical means at a rate of 0.05 gal/s.y. after thoroughly cleaning such surfaces of all foreign matter and loose material. Surfaces shall be dry before the tack coat is placed. The tack coat shall be applied immediately prior to laying the new pavement.

F. Placing Mix: Paving shall be laid in two courses except as noted on the Drawings. The thickness of each course shall be as shown on the Drawings and measured in place after compaction. The first course shall be the Binder Course and the second course shall be Top Course as defined in “Table A” of Section M3.11.03 “Job-Mix Formula” of the SSHB.

1. Any unsatisfactory irregularities or defects remaining after the final compaction shall be corrected by removing and replacing with new material as specified, to form a true and even surface. All minor surface projections, joints and minor honeycombed surfaces shall be ironed out smoothly to grade, as directed.

2. No vehicular traffic or loads shall be permitted on the newly completed pavement until stability has been attained and the material has cooled sufficiently to prevent distortion of loss of fines.

G. Rolling: Begin rolling mixture when asphalt concrete can bear weight of roller without excessive displacement. Roll at least three times and provide a smooth, compact, uniform surface free of roller marks. After first rolling repair displaced area as needed with additional hot material. Roll at least two additional times to thoroughly compact concrete to maximum density and to remove roller marks.

H. Tolerances: The finished surface of each hot-mixed asphalt course shall be tested for smoothness using a 10-foot straight edge applied parallel with and at right angles to the center line of the paved area. Surfaces exceeding the following tolerances within the 10-feet will not be accepted.

Top Course: 3/16-inch
Binder Course: 1/4-inch

3.03 PATCHING EXISTING ASPHALT PAVEMENT

A. In areas on site where new pavement abuts existing pavement and/or where existing pavement requires patching due to removal of existing pavement for installation of work under this Contract, patching of existing pavement shall be as follows:

1. Sawcut the existing edge of pavement in a straight line at a 90-degree angle to the vertical in such a manner that all existing loose or cracked areas of pavement are removed.

2. Edges of existing pavement shall be painted with a thin coat of bitumen (RS-1) immediately before placing new pavement.

3. Asphalt shall be installed as specified herein. Smooth transition surfaces shall be provided where new pavement abuts existing paved surfaces.

4. Joints shall be sealed and sanded immediately after new pavement installation.

B. All asphalt patching work within public right-of-ways shall be completed in accordance with the requirements of the authority having jurisdiction.

1. Provide traffic control for work within the public right-of-way.

2. All road surfaces shall be cut by an approved mechanical means before any excavation is started to insure against unnecessary damage to pavement.

3. Excavation shall be completed in a safe and workmanlike manner and is to create a minimum amount of obstruction to pedestrian and or vehicular traffic.

4. Gravel Borrow shall be used and placed on six inch layers and compacted to 95% of the maximum dry density by mechanical means.

5. Resurfacing:

1) The work to be completed hereunder shall include the replacement of all existing bituminous pavements disturbed by the work. This shall include roadways, sidewalks, berms, driveways, parking lots and other paved areas encountered in the work.
2) Resurfacing will not be strictly limited to those areas disturbed, when in the judgment of the Architect an expansion of the work is necessary for proper restoration and to those areas specifically shown on the Drawings.
3) All work shall conform the requirements of the Massachusetts Highway Department SSHB, latest edition. Specific gradations of mix will be as directed by the Town Engineer or Architect to suit the use intended.
4) All cut joints at existing and new top pavement surfaces shall be sealed with bitumen and sand. This includes roadways, sidewalks, driveways, and all other pavements.

3.04 CLEANING, REPAIR AND PROTECTION

A. Three days after rolling, the finished pavement shall be tested. Any section that shows ponding, indentation, rutting or picking up shall be resurfaced at the Contractor's expense.

B. Provide temporary protection to ensure work is completed without dirt, stains, damage or deterioration at time of final acceptance. Clean up stains and spills as they occur. Remove protection and clean as necessary immediately before final acceptance review.

3.05 GUARANTEE

A. The Contractor shall guarantee all pavement installations, including materials and workmanship, for a period of one year from the date of acceptance. The Contractor shall make interim repairs as necessary to maintain all paved areas in good, usable conditions.

END OF SECTION

SECTION 321313

CONCRETE

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The conditions of the Contract, including Division 00 and Division 01, apply to the work under this Section.

B. The Contractor shall prior to any removal of surplus fill, excavated material, or debris from the site, furnish written evidence satisfactory to the owner or owner's representative that he has an approved dumping location for debris and/or spoil from his/her excavation activities.

1.2 WORK INCLUDED

A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to furnish and install reinforced concrete pavement and footings, as indicated on the Drawings and as specified herein.

1. Concrete foundation repair – trench drains

B. Examine all other Sections of the Specifications and all Drawings for the relationship of the work under this Section and the work of other trades. Cooperate with all trades and all departments within jurisdiction and coordinate all work under this Section, including but not limited to:

1. Section 02 41 00 – Site Preparation
2. Section 31 20 00 - Earthwork
3. Section 31 12 16 – Asphalt Paving
4. Section 32 18 16 – Resilient Sport Surfacing
5. Section 32 18 00 – Synthetic Turf
6. Section 32 30 00 – Site Improvements
7. Section 32 90 00 – Planting
8. Section 32 91 00 – Loam and Planting Preparation

1.3 SUBMITTALS

A. Submit manufacturer's product data for the following if applicable:

1. Preformed joint filler

2. Surface Sealants

3. Reinforcement

4. Admixtures

5. Joint Sealant, color matched.

6. Chemical Surface Retarders

7. Cement Concrete Design Mix – 4500 PSI

1.4 LAWS, ORDINANCES, PERMITS AND FEES

The Contractor shall:

A. Give necessary notices, obtain all permits and pay all governmental taxes, fees and other costs in connection with this work, file all necessary plans, prepare documents and obtain all necessary approvals.

B. Obtain all required certificates of inspection for this work and deliver same to the Landscape Architect before request for acceptance and final payment for the work.

C. All concrete walks shall conform to the applicable regulations of the Massachusetts Architectural Access Board and the Americans with Disabilities Act.

1.5 DEFINITIONS

A. The following related items are included herein and shall mean:

1. S.S.H.B. - Standard Specifications for Highways and Bridges, the Commonwealth of Massachusetts, Department of Transportation, latest edition

2. A.S.T.M. - American Society for Testing and Materials

3. A.A.S.H.T.O. - American Association of State Highway and Transportation Officials

4. ACI – American Concrete Institute

1.6 SUBSURFACE INFORMATION

A. The Owner assumes no responsibility for the Contractor's failure to make his own site investigation and makes no representation regarding the character of the soil or subsurface conditions which may be encountered during the performance of the work.

1.7 FINISHED GRADES

A. The words "finished grades" as used herein mean the required final grade elevations indicated on the Drawings. Where not otherwise indicated, site areas shall be given uniform slopes between points, for which finished grades are shown, or between such points and existing grade except that vertical curves or roundings shall be provided at abrupt changes in slope.

1.8 GRADES AND ELEVATIONS

A. The Drawings indicate, in general, the alignment and finished grade elevations. The Landscape Architect, however, may make adjustments in grades and alignment as are found necessary to avoid interference and to adapt the grading to special conditions encountered.

1.9 WORK IN THE PUBLIC WAYS

A. Notify the appropriate municipal officials at least seven calendar days in advance of commencing any work in the public ways to obtain all required permission to perform this work. Perform all work in the public ways in a manner required by the municipal authorities.

B. Should there be any conflict between requirements specified in the Contract Documents and those of the municipality, the municipal requirements shall govern.

C. Do not close or obstruct any streets or sidewalks unless and until they have been discontinued by the appropriate municipal authority or unless and until he shall have first secured all necessary or other permits therefor. No materials whatsoever shall be placed or stored in the streets. Conduct all operations to interfere as little as possible with the use ordinarily made of roads, driveways, sidewalks, or other facilities near enough to the work to be affected thereby.

1.10 QUALITY ASSURANCES

A. Unless otherwise specified, work and materials for construction of the reinforced Portland cement concrete paving shall conform to referenced ACI specifications including, but not limited to 301, 309R, 310, 316R, and applicable portions MassDOT Specifications Section 476 Cement Concrete Pavement. In the event of a discrepancy between these specifications and referenced standards, the most restrictive shall apply.

B. Paving work and base course installation shall be done only after excavation and construction work which might damage them have been completed. Damage caused during construction shall be repaired before acceptance.

C. Existing paving areas shall, if damaged or removed during course of this project, be repaired or replaced under this Section. Workmanship and materials for such repair and replacement, except as otherwise noted, shall match as closely as possible those employed in existing work installed under this Contract.

D. Pavement, base, or subbase shall not be placed on a muddy or frozen subgrade.

PART 2 - PRODUCTS

2.1 AGGREGATE BASE COURSE

A. Base course shall be specified, provided, installed and paid for under Section 31 20 00 EARTHWORK

2.2 FORM MATERIALS

A. Unless otherwise indicated, construct form work for concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practical sizes to minimize number of joints and to conform to the joint system shown on Drawings. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.

B. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood," Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

C. Form Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect exposed concrete surfaces and will not impair subsequent treatments of exposed concrete surfaces.

2.3 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A615, Grade 60. Epoxy coated where indicated.

B. Welded Wire Fabric (WWF): ASTM A185, welded steel wire fabric. Fabric reinforcement shall be furnished in flat sheets.

1. Provide 6 inches x 6 inches W1.4 x W1.4 WWM for 4 inch thick concrete pavement.

C. Supports for Reinforcement: Provide supports for reinforcement including bolsters, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendations, unless otherwise acceptable.

1. Welded wire fabric support chairs shall be plastic supports that flex during concrete pours and gradually restore to original shape. Support chairs shall be Mesh-Ups distributed by www.globalindustrial.com 888-978-7759, or Landscape Architect approved equal.

D. Steel expansion dowels shall be hot-rolled plain steel rounds conforming to the requirements of AASHTO M31, Grade 60 and consisting of a one-half inch by twenty-four inches (1/2”x24”) smooth steel dowel and compatible waxed tube sleeve, twelve inches (12”) in length. Dowels and sleeves shall be as furnished by A.H. Harris & Sons, Inc., by U.S. Steel Corp., by Edgecombe Steel Corp., or approved equal. Dowels shall be epoxy coated.

2.4 PORTLAND CEMENT CONCRETE

A. Cast-in-place concrete shall be air-entrained concrete with a minimum 28-day compressive strength of 4500 pounds per square inch. Concrete shall be air-entrained 7% minimum, +/- 1% by volume. Concrete slump shall have a slump of 3 inches to 5 inches. Maximum aggregate size shall be ¾ inch. Thickness of concrete shall be as noted on the Contract Documents.

B. Cement shall be stored in a weather-tight structure and in such a manner as to prevent deterioration or intrusion of foreign matter. It shall be easily accessible for proper inspection and identification of each shipment. Cement that has hardened or partially set shall not be used.

2.5 CURING COMPOUNDS

A. All curing compounds shall conform to requirements of ASTM Designation C-309, Type I, clear and C-156. No materials containing wax or saponifiable materials will be permitted.

B. Curing compound shall be Master Builders "Master Seal", Symons "Cure and Seal", Sonneborn "Kure-N-Seal", "CS-309" by W.R. Meadows or equal, conforming to ASTM 309, Type 1 and 2.

2.6 EXPANSION JOINTS

A. Provide expansion joints, unless otherwise indicated on the Contract Documents, at 30 feet on-center, maximum.

B. Expansion Joint Filler:

1. Expansion joint filler between pours of concrete paving shall have a removable cap cover for the joint filler with integral permanent plastic bond breaker such as Snap-Cap from Seal Tight manufactured by W.R. Meadows, Inc., or approved equal. Cover width shall be sized to match width of joint filler.

2. Expansion joint filler at fixed objects shall be closed cell polymer foam meeting requirements of ASTM D1752, Sections 3.1 to 3.4, based on compression requirement of 10 psi minimum and 25 psi maximum. Recovery rate following 50-percent compression shall exceed 99-percent recovery, per ASTM D545. Foam shall be Ceramar foam filler manufactured by W.R. Meadows Co. or an approved equal. Joint sealant shall color match concrete refer to section 03300 for joint sealant requirements.

C. Expansion Dowels: refer to Reinforcing Materials in this Section

2.7 JOINT SEALANT

A. Joint sealant and primer shall be polyurethane-based, one component, elastomeric sealants, complying with Fed. Spec. TT-S-00230C, Class A Type 1. Color to match concrete. Sealants shall be self-leveling pour grade type.

1. Vulkem 45, as manufactured by Mameko International, 4475 East 175th Street, Cleveland Ohio 44182, (800) 321-6412.

2. Urexpan NR-210, as manufactured by Pecora Corporation, 165 Wambold Road, Harleysville, PA 10348, (215) 723-6051

3. PSI 951, as manufactured by Polymeric Systems Inc., Phoenixville, PA, (800) 228-5548.

B. Provide only materials which are known to be fully compatible with the actual installation condition, as shown by the manufacturer's published data or certification. Use manufacturer's recommended joint primer.

2.8 PROPORTIONING AND DESIGN OF MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Architect.

B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by the Landscape Architect.

C. Adjustments to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.

2.9 CONCRETE MIX

A. Job-Site Mixing: Mix materials for concrete in appropriate drum type batch machine mixer. For mixers of one cu. yd., or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than one cu. yd., increase minimum 1-1/2 minutes of mixing time by 15 seconds for each additional cu. yd. or fraction thereof.

B. Provide batch ticket for each batch discharged and use in work indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

C. Ready-Mix Concrete: Comply with requirements of ASTM C94, and as herein specified.

D. Delete reference for allowing additional water to be added to batch for material with insufficient slump. Addition of water to the batch will not be permitted.

E. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required.

F. When air temperature is between 85 Deg. F (30 deg. C) and 90 Deg. F (32 deg. C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 Deg. F. (32 deg. C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE

A. Areas to be paved shall be compacted and brought to subgrade elevation and all work specified, performed and paid under Earth Moving Specification Section. Prepared subgrade will be inspected by the Owner’s Representative. Contractor shall arrange to have the Owner’s Representative visit the site to inspect and approve subgrade.

3.2 AGGREGATE BASE COURSE

A. Base course shall be specified, provided, installed and paid for under Earth Moving Specification Section.

3.3 FORMWORK

A. Forms shall conform to the lines, dimensions and shapes of concrete shown providing for openings, recesses, keys, slots, beam pockets and projections as required.

B. Make forms clean and free of foreign material before placing concrete.

C. Do not use earth cuts as forms for vertical surfaces, unless approved by the Architect.

D. Design of Formwork

1. Comply with ACI 301, Chapter 4, Paragraph 4.2. Formwork drawings shall bear the seal of licensed professional engineer.

2. Form rods and tie wires of exterior surfaces shall slope down from the inside to outside of forms.

3. Provide forms so that no discernible imperfection is in evidence in finished concrete surfaces due to deformation, bulging, jointing, or leakage of forms.

3.4 REINFORCEMENT MATERIAL

A. Steel reinforcing shall be thoroughly cleaned of all foreign material which may reduce the bond between the concrete and reinforcing.

B. Welded wire mesh shall be placed midway within the depth with plastic Mesh-Ups support chairs specified herein in accordance with the manufacturer's recommendations. Mesh shall be parallel to the finished concrete pavement surface. Do not pour concrete over top of reinforcement unless it is supported underneath. Where mesh reinforcement is spliced, it shall be lapped at least 12 inches.

C. Reinforcing steel anchors shall be securely wired in the exact position called for, and shall be maintained in that position until concrete is placed.

D. Unless otherwise indicated on the Contract Documents, reinforcing shall extend within 2 inches of formwork and expansion joints.

3.5 EXPANSION JOINTS

A. Expansion joints shall be as located on the Contract Documents. Expansion joint shall be formed in the concrete to required width with preformed joint filler in place. Joint filler shall extend the full depth of the slab.

1. For concrete pavements, depth of joint filler shall be as required to form a 3/4 -inch deep sealant recess below finished concrete surface.

B. Provide expansion joints as indicated on the Contract Documents. Unless otherwise indicated on the Contact Documents, expansion joints shall be located at 30 feet on-center maximum for pavements.

1. Expansion joints shall be placed where pavement meets flush foundations and footings, concrete vertical curb or other vertical structures, including light bases, hydrants, walls, buildings, piers and walls, and at other conditions as shown on the Contract Documents.

2. Contractor shall request the presence of the Owner's Representative to review the layout of expansion joints prior to pouring the concrete.

3. Follow the manufacturer's application recommendations for joint filler and sealer.

4. Joint alignment shall be straight and true.

C. Where the expansion dowel system is used in the expansion joints, steel plates and pocket former sleeves shall be set parallel with the top and bottom surfaces of the concrete slab and installed according to the manufacturer's installation instructions.

3.6 PORTLAND CEMENT CONCRETE

A. Ready Mix Concrete

1. Comply with ASTM C94.

2. Add mixing water only at the site.

3. Discharge the concrete completely at the site within 1-1/2 hours after the introduction of the cement to the aggregates. In hot weather reduce this time limit so that no stiffening of the concrete shall occur until after it has been placed.

4. Begin the mixing operation within thirty minutes after the cement has been intermingled with the aggregates.

B. Placing Concrete

1. Preparation before placing: Conform to ACI 310, Chapter 8, Paragraph 8.1.

2. Conveying

a. Comply with ACI 301, Chapter 8, Paragraph 8.2.
b. Provide a spout or downpipe and elephant trunk or other appropriate method to prevent concrete from falling freely through a height greater than 3 feet.

2. Depositing: Comply with ACI 301, Chapter 8, Paragraph 8.3.

3. Consolidating: Comply with ACI 309R, "Recommended Practice for Consolidation of Concrete". All concrete shall be vibrated. Maintain at least one vibrator as a stand-by.

C. Curing

1. It is essential that concrete be kept continuously damp from time of placement until end of specified curing period. It is equally essential that water not be added to surface during floating and troweling operations, and not earlier than 24 hours after concrete placement. Between finishing operations surface shall be protected from rapid drying by a covering of waterproofing paper. Surface shall be damp when the covering is placed over it, and shall be kept damp by means of a fog spray of water, applied as often as necessary to prevent drying, but not sooner than 24 hours after placing concrete. None of the water so applied shall be troweled or floated into surface.

2. Concrete surfaces shall be cured by completely covering with curing paper or application of a curing compound.

a. Concrete cured using waterproof paper shall be completely covered with paper with seams lapped and sealed with tape. Concrete surface shall not be allowed to become moistened between 24 and 36 hours after placing concrete. During curing period sur-

face shall be checked frequently, and sprayed with water as often as necessary to prevent drying, but not earlier than 24 hours after placing concrete.

b. If concrete is cured with a curing compound, compound shall be applied at a rate of 200 square feet per gallon, in two applications perpendicular to each other.

c. Curing period shall be seven days minimum.

D. Form Removal

1. Do not remove forms until the concrete has thoroughly hardened and has attained sufficient strength to support its own weight and construction live loads to be placed thereon, without damage to the structure. In general, do not disturb forms for framing until the concrete has attained at least 40% of design strength for side forms and 80% of design strength for bottom forms. Remove no forms for 24 hours after placing concrete. Protect concrete walks from pedestrian traffic for a period of 3 days after placing. Damp cure as per standards above. Be responsible for proper form removal and replace any work damage due to inadequate maintenance or improper or premature form removal.

2. Where use of metal form ties extending to within less than 1-1/2 in. of the face of permanently exposed concrete has been unavoidable, cut off such ties at least 1-1/2 in. deep in the concrete but not less than 72 hours after concrete has been cast. Remove forms by methods which will not spall the concrete or cause any injury whatsoever. Hammering or prying against concrete will not be permitted.

3.7 FIELD QUALITY CONTROL

A. Sampling and testing for quality control during placement of concrete may include the following, as directed by the Landscape Architect.

B. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.

C. Slump: ASTM C143, one test for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.

D. Air Content: ASTM C173, volumetric method for lightweight or normal weight concrete; one for each set of compressive strength test specimens.

E. Concrete Temperature: Test hourly when air temperature is 40 deg. F (4 deg. C) and below, and when 80 deg. F (27 deg. C) and above; and each time a set of compression test specimens made.

F. Compression Test Specimen: ASTM C31; one set of 6 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

G. Compressive Strength Tests: ASTM C39; one set for each 100 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 5,000 sq. ft. of surface area placed; 1 specimen tested at 7 days, 2 specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

H. When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

I. Strength level of concrete will be considered satisfactory if average of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive by more than 500 psi.

J. Test results will be reported in writing to Architect and Contractor on same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day test.

K. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

3.8 FINISHING

A. General Requirements for Flatwork: Strike off top surfaces of finished fill and monolithic slabs true and level within a tolerance of 1/8 in. in 10 ft. and measured with a 10 ft. straightedge placed in any direction at any location. Set edge forms and intermediate screed strips accurately and sufficiently rigid to support screeds and so that proper surface elevations and concrete thickness are achieved allowing for dead load deflection and camber of formwork. Take measurements and control tolerances by the use of transit instrument. Upon completion of leveling, remove screed and fill spaces with concrete. Concrete shall have a medium broom finish of parallel marks. Brooming shall be at right angles to the axis of walk or as shown on the Drawings.

B. Control Joints shall be saw cut joints, sawn by using a diamond blade concrete power saw. Joint shall be made after concrete has completely cured and reached the required strength. Saw joints shall be straight and true to the Contract Documents.

1. Saw shall cut into slab at least 25 percent of slab depth.

3.9 PROTECTION OF CONCRETE SURFACES

A. Protection of Concrete: Under no circumstances shall the Contractor pour and leave the fresh concrete open to vandalism, while it is setting up. Damaged concrete shall be subject to rejection by the Landscape Architect.

3.10 ACCEPTANCE STANDARDS

A. The following acceptance standards shall be applied to this Contract. Any portion of the concrete paving that does not meet required acceptance standards shall be removed at the direction of the Owner’s Representative. Saw cut pavement at nearest adjacent tooled joint, remove

concrete pavement and discard off site in a legal manner and replace with new concrete pavement meeting the requirements of this Section.

1. Pavement surfaces shall be free of all cracking.
2. Pavement surfaces shall not pond water.
3. Pavement surfaces shall be free of visible high and low spots.
4. Steel mesh reinforcing shall not penetrate the surfaces or sides of the concrete pour.
5. Sawcut joints and all expansion joints shall be straight, true, uniform in width and free from twists, bends, kinks and misalignments.
6. Edges and the associated edging patterns shall be consistent, true, crisp and complete.
7. Pavement shall show no graffiti. Pavement shall show no rubbed surfaces indicative of attempts to erase graffiti.
8. Expansion joints and score joints shall be placed as required by the Contract Documents.
9. Concrete surfaces shall be free of all stains, including those created during the course of the construction by the Contractor, caused by natural events, or caused by vandalism.
10. All sawcut joints and expansion joints shall be flush.
11. Pours different in color as determined by the Owner's Representative.
12. Pours without expansion joints cast into them.
13. Pours not conforming to the Contract Documents.
14. All forms shall be removed from the site.
15. Exposed wall surfaces shall be free of surface voids and projections.

END OF SECTION

SECTION 321816

RESILIENT SPORT SURFACING

PART 1 - GENERAL

1.0 RELATED DOCUMENTS

This section is only a portion of the Contract Documents. All of the Contract Documents, including Conditions of the Contract and Division 1 General Requirements, apply to this section.

1.1 SPECIAL REQUIREMENTS / QUALIFICATIONS

A. The resilient sport surface herein specified shall be installed by the surfacing Contractor's own forces having at least 10 years experience including at least 12 successful outdoor synthetic track installations, and a crew supervisor with at least 6 successful surface installations of poured in place, two component elastomeric polyurethane synthetic track surfacing.

B. The surfacing contractor shall be a certified track builder with the American Sports Builders Association.

1.2 DESCRIPTION OF WORK

A. Provide all labor, materials equipment and services necessary to complete the work of this Section as specified herein and as shown on the Drawings.

1. Existing surface cleaning, patching and repair to track and field events.

2. Installation of new 13mm (1/2") track surfacing, urethane-based permeable resilient sport surface on existing asphalt paving as shown on the Contract Documents and specified herein.

3. Structural spray re-coating of track surface.

4. Measurement and Marking - Provide painted lane lines and associated markings for track and field events.

5. Surface Guarantee.

6. Clean up.

1.3 RELATED WORK

A. Carefully examine all of the Drawings and other Sections of the Specifications for requirements that affect, or are affected by the work of this Section. Other specification sections that directly relate to the work of this Section include, but are not limited to the following:

1. Section 02 41 00 – Site Preparation
2. Section 31 20 00 - Earthwork
3. Section 31 12 16 – Asphalt Paving
4. Section 32 13 13 – Concrete
5. Section 32 18 23 – Synthetic Turf
6. Section 32 30 00 – Site Improvements

7. Section 32 90 00 – Planting
8. Section 32 91 00 – Loam and Planting Preparation

1.4 GUARANTEE

A. Guarantee shall be a five (5) year unconditional guarantee from the manufacturer of workmanship and materials for the resilient sport surfacing from the date of acceptance. Track striping and markings shall be warranted for a period of thirty-six (36) months. During the guarantee period, the Contractor shall take all actions required to remedy to the Owner's satisfaction any deficiencies in the track surface.

B. Resilient surfacing material found to be defective as a result of faulty workmanship and/or material failure shall be replaced or repaired at no cost to the Owner, upon written notification within the guarantee period.

1.5 SUBMITTALS

A. Material certificates: Submit material certificates for all materials specified herein signed by material producer and Contractor stating that the materials are engineered and produced as a system for the specific purpose of exterior running track and field event resilient surface installations and that they are in compliance with the Contract Documents. Submit a copy of the manufacturer's unconditional workmanship and materials guarantee prior to ordering materials.

B. Material samples: Submit samples of the material components for the resilient sport surface system, as well as a fully-assembled sample.

C. Submit Certified Track Builder documentation provided by the ASBA. The installer must employ a certified track builder.

D. Materials shall be shipped in factory-sealed packaging directly from the manufacturer to the site and all shipping receipts shall be submitted to the Owner's Representative to document the amount of rubber and binder provided for incorporation into the Work.

E. Substrate acceptability: The Contractor shall submit a certified statement attesting that all surfaces to receive the resilient sport surfacing have been inspected and found satisfactory to receive the Work specified in this Section, and are not in conflict with Guarantee requirements.

F. Submit shop drawing drawn to scale for all track and field event surface markings to be reviewed by the Owner for approval prior to any line or symbol marking.

G. As-Built Survey: Upon substantial completion of the work, the Contractor shall submit an as-built survey performed by licensed professional land surveyor showing grades and dimensions as installed to verify compliance with the Contract Documents. The Contractor shall certify in writing that the installation is in compliance with NFHS and MIAA rules and regulations.

H. Submit name and qualifications of the line striper.

I. Submit name, contact and qualifications of the installer and a list of 12 track surface installations off this type within 100 miles.

J. Final acceptance: Submit 3 copies of maintenance manuals, which include care and maintenance of surface.

1.6 PROJECT CONDITIONS

A. Weather: No part of construction shall be conducted during a rainfall or when rainfall is imminent. After rainfall sufficient time shall be given to allow the surface to dry before resuming work. Surface shall be dry and clean before beginning application and both ambient and materials temperatures shall be at least 50 degrees Fahrenheit and rising.

B. Protection: Contractor shall provide all materials and labor necessary to completely protect adjacent materials and surfaces.

1.7 QUALITY ASSURANCE

A. Resilient surface materials and installation shall be approved for NFHS & MIAA installations. Only track systems included in this Section are considered pre-approved.

C. The completed track and field events shall conform to the guidelines of the NFHS and tolerances required by NFHS and MIAA regulations. All track and field event surfaces shall meet the material performance requirements set forth by the NFHS.

D. Prior to work, a pre-installation meeting with installer, landscape architect and owner shall establish special requirements, sequence and methods.

E. Prior to line striping, a meeting will be conducted to confirm all track markings.

1.8 REFERENCES

A. NFSH: National Federation of State High School Associations is the national governing body for high school competition.

B. MIAA: Massachusetts Interscholastic Athletic Association is the state governing body for high school competition.

C. ASBA: American Sports Builders Association

PART 2 - PRODUCTS

2.1 MATERIALS AND PRODUCTS

A. All materials specified herein shall be part of a complete system developed specifically for the construction of a synthetic running track surface. All products shall be provided by one manufacturer.

B. Track re-coating materials shall be compatible with the existing track surface. Contractor must confirm submit confirmation of compatibility of re-coating products. Re-coating components shall meet the following requirements:
   a. Structural application of aliphatic waterborne polyurethane and EPDM rubber granules
   b. Mixture shall be compromised of 60% pigmaneted aliphatic polyurethane and 40% fully encapsulated EPDM rubber granules.
   c. Color of rubber granules shall match existing track colors (color-1 at running lanes and color-2 at D-zones) or as selected by the Owner.

C. The Beynon BSS 100 track system as provided by Beynon Sports Surfaces, Inc is the product standard to which alternative track systems must comply. Any system to be approved as an

equal to the specified product must conform to the materials, performance and application requirements of the Beynon BSS 100 specification and as specified in this section.

D. Alternative Track Surface – Any alternative track surface paving system to be considered as an equivalent must be accompanied by certified test results based on IAAF test methods. Any product that is submitted with IAAF test results must include a stamped certification from the testing laboratory that performed the tests. Material tests shall include, but are not limited to spike resistance and ultra-violet deterioration resistance. Pre-approved alternative systems that are substantially equivalent in material and performance to the Benyon BSS 100 system described herein are:

1. Action Track 200, provided by Copeland Coating Company, Inc. 3600 US Route 20, Nassau NY 12123 (518) 766-2932

E. Components for the polyurethane surface coating shall meet the following requirements;

1. Primer	Shall be a polyurethane based primer specifically formulated to be compatible with the paved in place SBR granules and polyurethane track surfacing material.
2. Black SBR Granules	Rubber granules for the base mate shall be recycled SBR rubber, processed and chopped to 1 -3mm, containing less than 1% dust.
3. EPDM Granules	Rubber granules for structural spray wearing coats shall be EPDM synthetic rubber containing a minimum 20% EPDM resin, with a specific gravity of 1.5 ± 0.1g/cm3. The EPDM rubber color shall be either red or black as selected by the Owner.
4. Binder	Black mat binder shall be an MDI based single component polyurethane binding agent. The binder shall not have a free TDI monomer level above 0.2% and must be solvent free. The binder must be specifically formulated for compatibility with SBR crumb rubber.
5. Structural Spray	Spray coating shall be an MDI based single component, moisture cured, 100% solids, pigmented polyurethane, and compatible with EPDM granules. Coating shall match the existing track colors or as selected by the Owner.
6. Line Paint	The paint shall be a single component, moisture cured, aliphatic polyurethane paint compatible with the specified track surface material. All lane lines shall be bright orange. All symbols shall be white with bright orange drop shadow.

PART 3 – EXECUTION

3.1 REPAIR

A. Portions of the surface that are either weakened or have torn and delaminated shall be cut out and replaced with the polyurethane patching material.
B. It is strongly recommended the bidder perform a site visit prior to bidding to insure awareness of accurate repair scope.

3.2 CLEANING AND REPAIR

A. Prior to application of additional layers of new material, the existing surface shall be cleaned of all loose dirt and debris. This include weed treatment with an approved horticultural herbicide such as ECOsmart weed killer. Test weed treatment in conspicuous area to ensure no staining or discoloration. Any area of the existing surface worn to the asphalt or delaminated shall be removed, surface cleaned, and repaired.

3.3 STRUCTURAL COATING APPLICATION

A. Apply in 2 layers of graded EPDM rubber particles with pre-pigmented polyurethane coating. Layers shall total 3.6 lbs per SY.

3.4 INSTALLATION OF RESILIENT SURFACE

A. Apply resilient sport surface to all areas indicated on the plans and details of the contract drawings. Install in strict accordance with the manufacturer's recommendations and instructions. Verify that the asphalt base is constructed properly prior to the installation of the resilient surfacing. Asphalt base shall be sound, free of voids and a uniformity of less than 3/16" deviations measured in any 10-foot direction.

B. Finish surface preparation:

1. New asphalt surface shall be allowed to cure for a minimum of 14 days prior to installation of any resilient surface materials.

2. Prior to the application of the new wearing surfaces, the contractor shall coordinate with the owner/designer areas in need of repair. Areas to be addressed shall include pavement cracks, delamination of existing resilient surface and damaged or weakened areas of the resilient surface. Repairs shall be made that are compatible and consistent with the manufacturer's products. Selective removal of the existing rubberized surface is required over approximately 7.5% of the track surface

3. Areas to be repaired shall be repaired so that the new material will properly bond to those surfaces. The surface must be thoroughly cleaned of all loose dirt, debris, oil, grease or other foreign residue.

4. All areas in need of repair shall be allowed to cure prior to any further installation of resurfacing materials.

5. Prior to the application of resilient surface materials, the entire surface shall be flooded and checked for minor depressions or irregularities. Areas that contain water covering a 1 inch diameter or larger shall be marked and repaired in accordance with the track surfacing manufacturer's recommendations. After corrective work, the asphalt surface shall not vary more than 1/8-inch in 10 feet, measured in any direction.

6. After the asphalt base has been accepted and cleaned of all loose dirt and debris, apply the specified primer over the entire areas to receive the new resilient sport surface at a rate required as per manufacturers recommendations. A minimum of 30 minutes of curing time is required before application of the base mat material

D. Weather Limitations

1. Ambient and surface temperature must be 50* and rising.

2. Installation shall not be conducted during rainfall or when rainfall is imminent.

3. Do not apply when surface temperature is in excess of 140*F

D. Resilient Sport Surface

1. Shall be applied to achieve a dense uniform surface of no less than the specified thickness.

2. After the existing surface has been properly prepared and allowed to cure; apply tack coat primer as required by the manufacturer. Do not allow material to puddle on the surface.

3. The surface shall be applied to achieve the required thickness using a mechanically operated paver with heat controlled screed for the base mat application.

4. The base mat shall be allowed to cure thoroughly before structural spray application.

5. The base mat shall be evenly distributed amongst the rubber granules upon the application of materials coverage rates (measured in accordance with I.A.A.F. standards).

6. There should be no evidence of water present during the mixing process.

E. Material disposition quantities for the Beynon BSS 100 track surface are as follows;

Base Mat Course: The base mat shall consist of an 18-23% range polyurethane base mat binding agent and 77-82% range EPDM rubber base mat granulate.

Wearing Course: EPDM rubber granules (0.5 to 1.5mm) shall be evenly mixed the specified single component structural spray coating. Structural spray shall be made in a minimum of 2 uniform applications at a min. rate of 1.8lbs. per sq. yd., in opposite directions. Avoid leaving dry rubber granules more than one (1) layer thick. Do not proceed to successive layers until the previous layer is thoroughly dry.

F. Prior to the application of the final coatings and line marking, the surface shall be tested for the required surface depth, using a SMG-Sportplatzmaschinenbau GBMH surface depth gauge. The running track oval shall be tested in no less than 100 locations along the center of the outer and inner lanes and along the center of the track. If at least 80% of the readings meet the required thickness, the surface shall be deemed acceptable. If the surface does not meet the required depth, additional layers of rubber and binder will be applied until the proper depth has been achieved.

3.5 MEASUREMENT AND MARKING

A. Wait at least 48 hours after surface completion before applying line marking. The contractor shall supply all labor, materials and equipment necessary to perform the following:

1. No marking shall be performed without approved layout shop drawing. Refer to submittal requirements specified in this Section.

2. Locate and establish all radius points without damaging field.

3. Establish and set all necessary control points.

4. Layout all lines and markings to within a 1/2” tolerance.

5. Provide all computations and measurements in organized form.

6. Establish all locations on the curves using a transit or Theodolite capable of reading direct to 20 seconds.

7. Identify all markings, where appropriate, by painting the identification directly onto the track surface in 4-inch letters just below or in front of each mark in the right hand portion of the lane.

8. Paint all of the large, 3-foot high lane numbers in two (2) colors, utilizing shadowed backgrounds. Paint the name “SOMERVILLE” within the third running lane on the home side straightaway on center of the field.

9. All lines shall receive sufficient paint to assure complete opacity and uniformity of color.

10. Paints shall be used directly from original containers and shall be thinned only when hot temperatures dictate thinning for smooth applications.

11. Amount of paint used shall be as recommended by the manufacturer.

12. All measurements shall be made by competent, experienced and fully qualified personnel.

13. Upon completion of the track markings, a licensed professional engineer or registered professional land surveyor shall take the necessary measurements to certify the accuracy of the installation and markings. Refer to Item 1.5 SUBMITTALS, this Section.

14. The markings shall include all events and marks required or recommended by MIAA and NFHS.

3.3 SURFACE GUARANTEE

A. Submit the following surface guarantee on the installation company’s letterhead:

1. “(SURFACING CONTRACTOR) warrants the resilient surface at George Dilboy Memorial Stadium track for a period of Five (5) Years from date of acceptance against all defects in materials, including such defects as delamination, bubbling crackling, loss of integrity or excessive wear. (SURFACING CONTRACTOR) warrants that the lines and markings will be clearly legible for a period of 36 months. (SURFACING CONTRACTOR) will repair or replace any areas of the surface exhibiting defects at no cost to the Owner for the term of the guarantee.”

3.4 CLEAN UP

A. The Contractor shall remove all bags, pallets, plastic and any other items associated with the work of this Section and leave the site in clean, safe and finished condition.

END OF SECTION

SECTION 321823
SYNTHETIC TURF

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Complete installation of an infilled synthetic turf system and shock pad from the prepared subgrade to the finished grade as indicated on the Contract Drawings, including submittals as specified.

1. Inspect existing edging for structural integrity to accept new synthetic turf. Perform replacement or repair if needed.

2. Fine grade subgrade surface to meet subgrade elevations within the area to receive the synthetic turf system.

3. Prepare synthetic turf stone base in accordance with Section 312000 – Earthwork. Protect drainage system from damage during grading operations.

4. Furnish and install approved shock pad.

5. Furnish and install the complete synthetic turf system approved by the Landscape Architect.

B. Complete installation of synthetic turf lawn without shock pad at slope where indicated on the drawings and as specified herein.

C. Testing at the Contractor’s expense.

D. Corrective measures as necessary for system to meet the manufacturer’s requirements and the performance characteristics specified herein and in Section 312000 Earthwork

E. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work, as necessary to assure the steady progress of all work of the Contract.

1.2 RELATED WORK

A. Carefully examine all of the Contract Documents for requirements that affect the work of this Section. Other specification sections that directly relate to the work of this Section include, but are not limited to the following:

1. Section 02 41 13 – Site Preparation

2. Section 31 20 00 – Earthwork

3. Section 31 12 16 – Asphalt paving

4. Section 32 13 13 –Concrete

5. Section 23 18 16– Resilient Sport Surfacing

6. Section 32 30 00 – Site Improvements

7. Section 32 90 00 – Planting

8. Section 32 91 00 – Loam and Planting Preparation

9. Appendix A – Existing Field Testing Documents

1.3 EXISTING CONDITIONS

A. The Contractor shall protect the curbs, perimeter fencing, gates and drainage system as well as surrounding surfaces and hardware during removal/installation of the synthetic turf system and will be responsible for repairing any damage to all surfaces and hardware.

1. After removal of the existing turf and infill, the existing concrete edging shall be inspected. The Contractor shall schedule a site meeting with the Owner to photo-document the condition of the existing curb edge and drains prior to any further equipment access.

2. The Contractor shall inspect existing drainage system and clean as required to ensure proper function. This inspection includes all cleanouts, drain inlets and outlets and downstream drainage structures

B. The Contractor is responsible for any damage to the base during removal/installation of the synthetic turf system.

1.4 QUALITY ASSURANCE

A. Manufacturer/product qualifications: In order for the woven synthetic turf product to be approved for this project, the synthetic turf manufacturer shall have a minimum of forty (40) woven synthetic turf field installations similar to the turf system specified for this project, each 80,000 square feet or larger completed and in use in the last five (5) years. The manufacturer shall submit references from at least seven (7) installations of the same specified system.

B. Installer Qualifications: The installation contractor for the synthetic turf shall be a certified installer, certified by the manufacturer of the approved turf system. The preparation, construction and installation of the approved woven synthetic turf field system shall be completed by a contractor certified by the manufacturer of the approved turf system and has completed at least ten (10) synthetic turf field projects, each 80,000sf or larger in the last five (5) years. Subcontracted labor and or supervisors not employed by the approved installer are not acceptable. The installer must have at least three years of continuous business under the same name and or organizational structure. Business alliances, joint ventures or partnerships formed to comply with any of these qualification requirements shall not be accepted. The installation contractor shall submit references from all synthetic turf installations they have performed within the past five (5) years to include the Owner's contact name, address and phone number.

C. To ensure quality control and workmanship, the installation company's supervisor for this project shall be the primary installation company's representative on-site, to oversee the complete installation work. Part-time or replacement personnel will not qualify as the installation supervisor during any part of the installation process, unless the contractor provides written qualifications for the replacement supervisor to the Landscape Architect for approval. Approval must be received prior to the replacement personnel's involvement with this installation.

D. The manufacturer's representative shall be present (on site) during the installation process to approve the drainage stone preparation and installation of the shock pad and synthetic turf system.

E. All designs, markings, layouts and materials shall conform to all standards and rules of the applicable state, national and/or international governing body.

F. Source limitations: All components of the Synthetic Turf system shall be provided from a single-source Synthetic Turf System Manufacturer.

G. Seams between turf panels shall be glued. Turf panels shall be 15-feet in width. Turf Carpet shall be glued and mechanically attached to the perimeter edging in accordance with the manufacturer's recommendations.

H. Field markings shall be woven into the continuous woven turf (no seams) of the turf panel rolls during the manufacturing process, to the extent which the approved manufacturer is capable. All other field markings shall be inlaid. Approval by the Landscape Architect is required prior to that start of the inlaid markings.

I. Third Party Testing: Where specified herein, an independent third party testing agency shall be retained by the Contractor to perform all required testing. Pre-approved testing agencies include:

1. Firefly Sports Testing – Hooksett, NH t:603-715-5453

2. Labosport – Dalton, GA t:706-529-9474

3. Sports Laboratories- Chattanooga, TN tel 423-617-6928

1.5 SUBMITTALS

A. Items to be submitted prior to ordering materials:

1. Manufacturer and installer qualifications as required under item 1.4 herein.

2. Specifications of the turf system components' physical properties and assembled system performance characteristics meeting requirements specified herein and industry standards including certification from the turf manufacturer that lead or lead chromate, and PFAS/PFOS are not used in the manufacturing of the specified system. Submit manufacturer's specifications and installation instructions for all products in the synthetic turf system, including certifications and other data as required to show compliance with the Contract Documents and conformance with material environmental and safety standards and regulations.

3. Warranty terms indicating available coverage and terms as specified under item 1.6 herein.

4. Synthetic turf system manufacturer's certification in writing that their turf system, materials, details and/or installation methods do not violate any manufacturers' patents or patents pending. It is the intent of this Section not to infringe upon any existing patents, licenses or rights of individuals or companies.

a. It is the responsibility of the synthetic turf manufacturer and installer to verify that their system, materials and installation methods are not protected by patents, licenses or rights of others.

b. Upon approval of the synthetic turf system, the manufacturer and installer shall hold the Owner and Architect harmless as to any liability and or costs of any type,

including but not limited to, legal costs, royalties, replacement costs, etc. associated with any patent infringement claim from their materials and or installation.

5. Provide impact attenuation ASTM F355 (GMAX) and ASTM F1292 Hemisphere Impact Attenuation (HIC) test results of the specified system from prior installations. The test results submitted shall demonstrate that the synthetic turf system for this project shall have a GMAX value as specified herein, that shall not exceed 120 GMAX and a HIC value below 1,000 at 1.3 meters during the warranty period or the system's life expectancy.

6. Submit manufacturer's product data for all components, installation instructions, warranty(s) along with material component samples and a sample of the assembled system (approximately one (1) square foot).

7. Submit a shop drawing plan at 1"=30' containing all pertinent information regarding field layouts, colors and installation. Provide a seaming plan at 1"=30', edge details.

    a. Mock up:

        1) Upon acceptance of the completed submittal, the installation contractor shall construct a 2-foot by 2-foot or larger mock up panel on site for approval by the Architect and Owner. The mock up shall include one seam and one edge of the assembled sample, which shall include a woven line of each color specified, inlaid through the middle to depict materials, color and workmanship.

        2) The mock up panel shall be representative in every way of the composition, strength, color, texture, installation details, and performance of the material to be assembled as the finished system and may be tested for comparison with submitted test data.

        3) The mock up shall be used as a quality and performance datum for comparison to the finished installation.

8. One (1) quart sample of turf infill mix at the proper mix ratio.

9. Sample of the shock pad underlayment.

10. Full range of fiber colors for selection.

11. An 18-inch square sample of turf carpet including glued seam.

12. Lead Test to meet 2015 CPSC requirements. Not to exceed 50 P.P.M. Refer to Item 1.08 as specified herein.

13. Lab test results demonstrating the submitted turf system complies with all One Turf Concept performance and longevity guidelines.

B. Items to be submitted after manufacturing but prior to installation:

1. Post manufacturing/pre-shipment test results from an independent lab for carpet identification shall include tuft bind, pile height, pile weight, carpet mass, tuft count, Dtex values, lead content in parts per million and EPA Method 537 Modified test results showing non-detect (ND) for 30 PFAS compounds.

C. Items to be submitted during installation and prior to substantial completion:

1. Compaction, planarity and permeability (infiltration) test results as specified herein demonstrating conformance with specified performance requirements, at least one week prior to installation of the shock pad.

2. Seam strength testing in accordance with EN 12228 Method 1. Three (3) samples minimum. Seam strength shall be greater than or equal to 300lbs/ft.

3. Carpet identification test results including tuft bind, pile height, pile weight, carpet mass, tuft count and Dtex value, Three (3) samples minimum.

4. Dimensional stability test results in accordance with ASTM D1204 (modified) Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting of Film at Elevated Temperatures. Three (3) samples minimum.

5. The synthetic turf manufacturer/installer shall submit written certification of their acceptance of the following substrate components, installation and properties prior to installation of the synthetic turf system. Such certification shall be based on field verification of installed conditions and shall include dated and time-stamped photographs documenting these stages of construction.

   a. Gradation and permeability test results on the existing synthetic turf base stone.

   b. Top Stone slope and fine grading prior to installation of the shock pad and turf carpet fabric.

   c. Drainage base approval shall include acceptance of the compaction, planarity, permeability and stability of the base.

6. Manufacturer's review: Submit written statement signed by the Contractor and synthetic turf surfacing installer stating that the Drawings and Specifications have been reviewed by qualified representatives of the materials manufacturer, and that they are in agreement that the materials and system to be used for synthetic field surfacing are proper and adequate for the applications shown.

7. Submit delivery slips for all Synthetic Turf system materials delivered to the site, to the Owner's representative upon delivery of materials.

D. Items to be submitted prior to final completion:

1. Submit a written statement signed by the manufacturer stating that the field supervision of the manufacturer's representative was sufficient to ensure proper application of the materials, that the work was installed in accordance with the Contract Documents, and that the installation is acceptable to the manufacturer.

2. Provide warranty materials as specified herein, properly executed and registered with the Manufacturer, Contractor and insurance carrier.

3. Provide GMAX, HIC and One Turf Concept testing as specified herein under item 1.4 & 1.8, and As-Built survey results verifying that the performance of the installed system, meets all requirements of this specification and applicable safety standards and requirements.

4. Provide on-site One Turf Concept testing for performance and longevity on the installed field.

5. Provide one digital copy in PDF format of Maintenance Manuals which include all necessary instructions for the proper care and preventative maintenance of the synthetic turf system, including painting and markings.

6. Provide extra and additional materials to the Owner:

   a. One contiguous green piece of synthetic turf 15’ wide by 15’ long from the same production run as the turf supplied to this project, as well as all salvageable remnants from the installation.

   b. Two hundred pounds of approved and installed sand.

   c. Five hundred pounds of approved and installed plant-based infill.

1.6 WARRANTY

A. The synthetic turf provider shall provide a ten (10) year pre-paid warranty for Dilboy Stadium that is insured by a policy of insurance issued by a reputable insurance company and must have the following policy features:

1. Stating that all work executed under this Section will be free from defects in material and workmanship without limitations for a period of the required warranty length from the date of Substantial Completion, and that any defects will be remedied on written notice at no additional cost to the Owner.

2. Coverage of all materials and labor shall provide for all costs up to and including the full value of a complete re-installation of the synthetic turf system and all preparation and disposal costs.

3. This warranty shall include all components of the system in its coverage.

4. The manufacturer shall warrant that materials and their performance shall meet or exceed the product specifications.

5. The warranty shall not limit the types of sports and recreation activities or uses that are typical of similar soccer, lacrosse and football field installations.

6. The insurance premium for this coverage shall be paid in full for the entire length of the warranty.

7. Insurance coverage shall specifically provide for reimbursement to the warranty holder in the event of bankruptcy of the synthetic turf provider.

8. Insurance coverage shall apply to playing surface inclusive of infill, seaming, labor and colored inlays for event markings.

9. Provide the following documents: Warranty Certificate, Accord Certificate, the actual Insurance Policy, and proof of A.M. Best Rating for the insured warranty provider.

10. Insurance coverage shall apply to the full warranty period from completion date of project, with no uninsured periods or periods of self-insurance.

11. Insurance is provided by a third-party insurer with an A.M. Best financial strength rating of "Excellent" or higher.

12. Insurance coverage shall not have exclusions for epidemic or catastrophic failure.

13. Insurance coverage shall not limit the hours of use.

14. Insurance coverage shall not exclude heavy trafficked areas or related uses such as team or band practices.

15. Insurance coverage shall not exclude any colored turf fibers.

16. Insurance coverage shall provide a minimum claim limit of $5 million in the aggregate per annum.

17. Insurance coverage shall provide a minimum claim limit of $ 300,000 per field.

18. Provide the actual executed Policy from the insurance carrier.

19. Include certified evidence that the manufacturer has in place a minimum of $500,000.00 in cash in a separate warranty reserve account for small warranty repairs.

E. Response time to perform emergency warranty repairs shall not exceed 24 hours from the time of contact. The warranty shall guarantee the availability of replacement material for the synthetic turf system for the full warranty period. The warranty shall state that the intended use as a multi-purpose field for training and games including the use of cleats is covered under the material and workmanship warranty.

F. Starting with the completion of construction, the synthetic turf manufacturer/installer shall retain a third party (independent) certified testing laboratory approved by the Owner to perform shock absorption testing once each year during the life of the Warranty in accordance with ASTM F 1936, ASTM F 355 and ASTM F 1292. Testing shall be performed at the field's center, the goal locations for all sports and 10 yards inside each corner. G-Max shall not change more than 5% at any one location per year over the life of the guarantee and at no time shall be less than 85 or greater than 120 at any one point of the field. HIC value at installation and over the life of the guarantee shall be below 1,000 at 1.4 meters for each location. In cases where the results of the testing fall outside this range, the condition shall be repaired and the G-Max re-tested by the manufacturer to return the field to within the specified range.

G. Within the first 3 months after final acceptance, the turf installation contractor shall replenish the specified infill material to the required depth at no additional cost to the Owner if the depth of the infill is found to have settled to be less than the specified depth throughout the field surface during that timeframe. Only a plus (+) tolerance of 1/8" will be accepted for infill depths.

1.7 PROJECT CONDITIONS AND COORDINATION

A. Weather: The turf contractor shall perform work only when permitted by weather conditions meeting the manufacturer's requirements. No part of the construction shall be conducted during a rainfall or when rainfall is imminent.

B. Coordination: The turf installation contractor shall coordinate work with the General Contractor and his subcontractors. Specific attention is called to the required coordination at all edges of the synthetic turf field area.

1.8 REFERENCES

A. Comply with all local, state and federal codes and regulations, including all ADAAG regulated testing. Comply with applicable requirements of the latest editions of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

B. American Society of Testing and Materials (ASTM).

1. C 131 Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

2. D 395 Rubber Property – Compression Test.

3. D 418 Pile Yarn Floor Covering Construction.

4. D 422-63 Particle Size Analysis.

5. D1204 (modified) Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting of Film at Elevated Temperatures.

6. D 1335 Tuft Bind of Pile Floor Coverings.

7. D 1557 Laboratory Compaction Characteristics of Soil Using Modified Effort.

8. D 1577 Linear Density of Textile Fibers (Denier).

9. D 1682 Breaking Load and Elongation of Textile Fabrics.

10. D 2256 Breaking Load (Strength) and Elongation of Yarn by the Single-Strand Method.

11. D 2434 Permeability of Granular Soils (Constant Head).

12. D 3776 Mass Per Unit Area (Weight) of Woven Fabric.

13. D 3786 Hydraulic Bursting Strength of Knitted Goods and Non-Woven Fabrics: Diaphragm Bursting Strength Tester Method.

14. D 4491 Water Permeability of Geotextiles by Permittivity.

15. D 4533Trapezoid Tearing Strength of Geotextiles.

16. D 4632Breaking Load and Elongation of Geotextiles (Grab Method).

17. D 4833Index Puncture Resistance of Geotextiles, Geomembranes and Related Products.

18. D 5034 Breaking Strength and Elongation of Textile Fabrics (Grab Test).

19. D 5034-05 Breaking Strength and Elongation of Textile Fabrics (Grab Test Modified for Seam Strength).

20. D 5848 Mass per Unit Area of Pile Yarn Floor Coverings.

21. E1792-96E Standard Specification for Wipe Sampling Materials for Lead in Surface Dust.

22. F 355 Shock Absorbing Properties of Playing Surface Systems and Materials (GMAX).

23. F 1292 Standard Specification for Impact Attenuation of Surfacing Materials within the Use Zone of playground Equipment (Head Injury Criterion - HIC).

24. F 1551-97 Comprehensive Characterization of Playing Surface Systems and Materials.

25. F 1936 Shock-Absorbing Properties of North American Football Field Playing Systems as Measured in the Field.

26. F2765 Total Lead Content in Synthetic Turf Fibers.

27. 3575-08 Standard Specification for Flexible Materials – Tensile Strength and Tensile Elongation

C. British Standards Institution.

1. BS 7044, Method 4 Double-ring Infiltrometer (At Owner's discretion).

D. European Committee for Standardization (EN)

1. EN 12616 Water Infiltration Rate

2. EN 12228 Method 1 Determination of joint strength of synthetic surfaces

E. Massachusetts Department of Transportation Standard Specifications for Roadways and Bridges.

F. Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO).

G. American National Standards Institute (ANSI).

H. Consumer Protection Safety Commission (CPSC).

I. Occupational Health and Safety Administration (OSHA)

J. Environmental Protection Agency (EPA).

K. American Concrete Institute (ACI).

L. Synthetic Turf Council Guidelines and One Turf Concept Initiative (STC) www.syntheticturfcouncil.org.

M. American Sports Builders Association Guidelines (ASBA) www.sportsbuilders.org.

N. Massachusetts Interscholastic Athletic Association (MIAA) www.miaa.net.

O. National Federation of State High School Associations (NFHS) www.nfhs.org.

P. National Collegiate Athletic Association (NCAA) www.ncaa.org.

Q. International Amateur Athletic Federation (IAAF) www.iaaf.org.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver manufactured materials in original packages with seals unbroken and bearing manufacturer's labels indicating brand name and directions for storing.

B. Store manufactured materials in a secure, clean and dry location protected from the weather, vandalism and deterioration, and complying with manufacturer's written instructions for minimum and maximum temperature requirements for storage.

C. Store rolls of synthetic turf horizontally on flat surfaces. Do not stand or stack rolls upright.

PART 2 - PRODUCTS

2.1 DRAINAGE BASE STONE

A. Re-use existing base stone material. Drainage stone to supplement existing top layer of stone indicated on the contract drawings shall be in accordance with Section 312000 Earthwork.

2.2 TURF EDGER

A. The existing turf edger shall be protected and reused to accept the new synthetic turf. In the case a repair is necessary the concrete shall be cast-in-place and shall have a 28-day compressive strength of at least 4,000 pounds per square inch with a light broom finish.

B. PVC ANCHOR BOARD

1. PVC Anchor Board shall be cellular PVC trimboard 5/8" thick x 3 ½" wide x 12' maximum length.

2. One-component, polyurethane-based, moisture curing construction adhesive shall be Loctite PL Premium Construction Adhesive, or equal. Adhesive shall be non-shrinking and moisture-resistant with superior bond strength between concrete and cellular PVC.

3. Tapcon screws with corrosion resistant coating shall be 1.75" minimum length.

2.3 WOVEN SYNTHETIC TURF SURFACE & INFILL SYSTEM

A. The complete permeable and infilled woven synthetic turf system submitted to and approved by the Landscape Architect and Owner shall meet the requirements specified herein. The Contractor shall submit comprehensive information that clearly demonstrates the synthetic turf system meets all specified material, performance and qualification requirements. Tufted synthetic turf systems are not acceptable.

B. The synthetic turf system shall be considered "PFAS/PFOS free" according to REACH and PROP 65. Turf system shall be non-detect (ND) for 30 PFAS compounds tested via EPA Method 537Modified and have a statement from the vendor that the turf does not contain and is not manufactured with PFAS/PFOA.

C. All material used in the artificial system must meet environmental and human health standards established in this specification. Documentation of chain of custody for materials may be required.

D. Woven Synthetic Turf:

1. Total woven synthetic turf carpet system shall consist of the Polyolefin Family of thermoplastics. Mixing of different polymer families and/or variable material content will not be accepted. Turf system shall be of a homogeneous material composition. Urethane coatings are not acceptable.

2. Total woven synthetic turf carpet system shall be 100% closed-loop (cradle-to-cradle) recyclable.

3. Turf system shall be fabricated as a woven system consisting of a blend of monofilament and tape fibers meeting the performance requirements specified herein.

4. Any secondary backing shall be a similar plastic formulation as the fiber to maintain the fully 100% closed-loop recyclability of the entire carpet.

5. Synthetic turf shall have a TEN (10) YEAR warranty meeting the requirements specified under Item 1.6 of this section 321823.

6. Turf shall surpass 200,000 Lisport Cycles as certified by a 3rd party independent testing agency.

7. Physical properties and performance characteristics of the synthetic turf components and system shall meet the manufacturer's standard specifications for the approved synthetic turf system and the following criteria.

Turf Content	80,000 denier [4 bundles of 12,000/6 monofilament at 365-micron thick with 4 each 8,000/1 tape (36fibrils)] woven at 12 pic with U.V. stable PP and PE fibers for the base structure
Pile Height	2.0 inches
System Permeability	79 inches/hour minimum
Pile Weight	>59 ounces/square yard
Tuft Bind Strength	>18 lbs.
Breakload	18 lbs. minimum per ASTM D 2256
Elongation at Break	47% minimum per ASTM D 2256
Total Weight	>85 ounces/square yard
Grab Tear (Width and Length)	>270 lbs

3. Yarn shall be a UV resistant, multi-structured/parallel fiber extruded of monofilament and slit film polyethylene grass-like fibers with a finished pile height of 2.0 inches with a +1/8" height tolerance after any shrinkage from manufacturing. The turf shall be suitable for all field sports, and all normal activities held on athletic fields. Primary field color shall be selected from the manufacturer's standard green colors.

a. Provide woven and inlaid markings where required per drawings installed in accordance with the manufacturer's recommendations. Lines shall be woven within the 15-foot wide rolls to the maximum extent possible.

1) Football: White

2) Soccer: Yellow

3) Lacrosse: Blue

4) Tick Marks: Red

5) Or as indicated on the Drawings

b. Glued seams: Seaming tape and adhesive shall meet the approved synthetic turf manufacturer's requirements and minimum performance characteristics specified herein.

1) Adhesives for bonding woven synthetic turf shall be one-component fast-set urethane adhesive obtained from a single manufacturer and be equivalent to Ultrabond Turf PU 1K as manufactured by Mapei Corporation, Deerfield Beach, FL (800) 992-6273, or approved equal or a one-part moisture cured polyurethane obtained from a single manufacturer and be equivalent to 34-G as manufacturer by Synthetic Surfaces inc, Scotch Plain, NJ tel 908-233-6803.

2) Tape for securing seams in the woven synthetic turf and inlaid lines shall be high quality tape made with a minimum roll width of 12 inches.

E. Infill Material:

1. The composite infill shall include a blend of rounded silica sand and plant-based infill.

2. The material requirements specified herein shall be combined at a ratio of 80% sand and 20% plant-based infill by weight. Sand content shall not exceed 5 lbs/SF or 18mm in depth. Total depth of infill shall be a minimum 38 mm with a + tolerance of 4mm. Additional plant-based infill may be required to achieve infill depth requirements

3. Sand shall be a 20-40 round to sub-round; dust-free dry silica sand, meeting the following Particle Size Distribution:

Sieve Size Mesh	Min % Retained	Max % Retained
8	0	0
10	0	0
12	0	0.1
14	0	0.5
16	0	15

20	10	60
30	10	90
40	0	40
50	0	5
60	0	0.5
70	0	0.5
100	0	0.5
pan	0	0.5
	Total – 50M	<1

a. Krumbein #must be $\geq$ to 0.4.

b. API Crush – 50M fines generation at 80 psig: $\leq$ 0.4%.

4. Plant-based infill shall be BrockFill by BrockUSA, Boulder, CO, or approved equal, locally represented by Eric Hughes tel 781-883-9663

a. Other Approved Equals:

1) Safeshell by US Greentech, Cincinnati, OH tel 888-323-0721

b. Material requirements

1. 100% plant-based material free of pesticides and heavy metals as determined by AOAC Method 2007.01

2. Infill shall be manufactured from sustainably harvested sources.

3. Vertical drainage that exceeds the synthetic turf product using ASTM 1551.

4. Resistant to degradation in accordance with BS EN 933-1:2012. 80% shall be between 0.8mm – 2mm.

5. Hydrophilic, absorptive of rain and condensation.

6. Min. bulk density of 16.5lbs/cu ft.

7. Infill shall not float.

8. Shall provide a minimum 10 year warranty

2.4 RESILIENT UNDERLAYMENT (SHOCK PAD)

1. Submittals:

a. Product Data: Submit 8" x 8" product sample and technical data sheet.

b. Shop Drawings: Submit cross-sectional view showing product installation in relation to sub-base and synthetic turf (including edge attachment).

c. Test Data: Submit listing of all applicable test data for compliance to specifications. All testing to be performed by independent sources following applicable ASTM or other internationally recognized standards and procedures.

d. Installation: Submit copy of product installation instructions. Submit copy turf installation recommendations.

e. Warranty: Submit copy of product 16 -Year warranty coverage.

2. Shall be SP-17™ by Brock® and as supplied by Brock International, Boulder CO 80301, or approved equal, locally represented by Eric Hughes tel 781-883-9663 Additional acceptable expanded polypropylene shock pad products include these sources:

   a. ShockWave Ecobase, www.nottssport.co.uk

   b. UltraBaseMAX, www.ultrabasesystems.com

3. Underlayment shall be 17 mm thick expanded polypropylene designed for athletic fields. Material thickness shall be based upon product thickness needed in order to meet the system performance requirements.

4. Gmax of the complete synthetic turf system including shock pad shall be between 85-120 throughout warranty period and must not exceed 120 for the life of the system.

5. The complete synthetic turf system including shock shall meet minimum critical fall height of 1.4m per IRB Reg 22 and One Turf Concept at installation and throughout the warranty period. HIC not to exceed 1000 on pad from a 1.4m drop height of for the life of the system.

6. Product shall drain at greater than 300 inches per hour.

7. Warranty shall be 16 years or more and cover the cost to replace or repair the turf in affected area in the event of product failure. Warranty must guarantee the turf/pad system not to exceed 120 Gmax for the life of the turf with no less than 1" of infill.

8. Recycled expanded polypropylene content shall not exceed 30 percent.

9. When tested with the Deltec field tester, vertical deformation must remain between 7-11mm.

10. Supplier must provide documentation that product meets human health screening levels and total threshold limit concentration using EPA Method 3052 and Title 22 (CAM 17) metals using EPA Method 6020/7471A and for hexavalent chromium using EPA Method 7196A.

11. Manufacturer must prove absence of heavy metals in production material, and a controlled chain of custody for all materials used.

12. Product must be of a homogeneous material composition. Variable material content will not be accepted.

2.5 WOVEN SYNTHETIC TURF MAINTENANCE EQUIPMENT

A. Provide one (1) Synthetic Sports Turf Groomer with integrated Spring Tine Rake for routine maintenance of the synthetic turf field. Maintenance equipment shall be Model# 920SDE as provided by GreensGroomer WorldWide, Inc. PO Box 34151, Indianapolis, IN 46234. 888-298-8852, or equal as approved by the Landscape Architect.

1. Sports Turf Groomer shall be:

a. Towable product.

b. Constructed of steel tube with powdercoat finish.

c. Length shall be minimum of 48” and minimum width of 72”

d. Groomer shall have an electric lifting mechanism to lift the brushes and spring tines off the field surface.

2. Spring Tine Rake Attachment shall be:

a. Attachable product compatible with the Turf Groomer product

b. Frame shall be constructed of steel with powdercoated finish

c. Width shall be minimum 72”

d. Tines shall be 3/16” diameter with a tip bend between 38-42 degrees.

e. Three (3) rows of tines with each row consisting of 12-14 tines. Tines shall be spaced 7/8” apart. Tines shall be offset from the other rows.

f. Each row shall be independently adjustable for depth and allowed to be set in a forward or backward position for various levels of aggressive raking.

g. Rake attachment shall be able to fully retract the tines allowing the rake to remain attached to the groomer when not in use.

B. Provide one (1) LitterKat Synthetic Turf Sweeper with Tow-magnet as provided by GreensGroomer WorldWide, Inc. PO Box 34151, Indianapolis, IN 46234. 888-298-8852, or equal as approved by the Landscape Architect.

1. Sports Turf Sweeper shall be:

a. Towable product

b. Steel Construction with powdercoat finish

c. Width shall be a minimum of 72”

d. Sweeper shall be direct drive gear drive

e. Debris basket shall be removable

f. Sweeper shall have an electric lifting actuator to lift basket and sweeping brush off the field surface.

2. Magnet bar shall be:

a. Towable product

b. Width shall be minimum of 72” , depth of minimum 5” , height of 2” minimum

c. Magnet shall be industrial quality capable of extracting ferrous objects from deep within the synthetic turf surface.

2.6 SYNTHETIC TURF LAWN

A. Synthetic Turf Lawn shall be as follows:

1. To establish the standard of quality, design, and function desired, Drawings and Specifications are based on DuPont “ForeverLawn Select HD” available from ForeverLawn 5801 Mayfair Rd., Suite 4, North Canton, OH 44720, 866-992-7876.

a. Additional acceptable manufacturers are noted below provided they meet the performance and aesthetics specifications of realistic looking lawn with multi-color blades.

1) X-Grass parent company Challenger Industries, Dalton, GA. Tel 877-881-8477.

2) SynLawn as distributed by New England Turf Store, 5 Fulton St, Canton, MA 02021. Tel 781-821-0112.

3) Or approved equal.

2. Synthetic Turf must meet or exceed the following criteria and physical properties:

a. Fiber:

1) Primary: polyethylene 2 color monofilament memory fiber, low glare finish. Finished height 1.75 inches, Color: Field and Olive Green.

2) Secondary: heat set textured nylon monofilament, 2 color Turf Green and Dark Tan thatch layer.

3) 50 oz. minimum total fiber face weight.

4) Tuft Gauge 3/8”

b. Backing:

1) Primary: 18 pic reinforced tri-component.

2) 50 ounce BioCel Polyurethane with 6 ounce non-woven geotextile laminate.

c. Permeability 30 inches per hour minimum.

d. Tuft bind strength 9 lbs. or greater.

e. Lead: less than 50 ppm in each component.

f. Glued seams: Seaming tape and adhesive shall meet the approved synthetic turf manufacturer's requirements and minimum performance characteristics specified herein. Refer to Woven Synthetic Turf specification herein for seaming tape and adhesive product requirements.

3. Infill: Sand infill shall be sub round to sub angular with 80% round, dust-free, dry silica sand. One hundred percent of sand particle sizes shall be larger than 0.40 millimeters and smaller than 1.7 millimeters. Uniformity Coefficient 1.5. Sand shall be 10-20 Synfill Sportsfield Sand as supplied by Target Technologies International, or approved equal. (888) 887-7373. www.TTIIOnline.com. Apply sand at a rate of 0.5 pounds per square foot.

4. Turf Anchor: Shall consist of rough-sawn Pressure Treated Timber as dimensioned on the drawings. Connection hardware shall be Stainless Steel.

5. Base Materials:

a. Gravel Borrow as described in Section 312000 Earthwork.

b. Top base layer shall be Stabilized Stonedust with Organic-Lock as supplied by Read Custom Soils, Tony Will 617-835-3950 or approved equal.

6. Inlaid logo and custom font lettering shall be a 3-color custom design (blue, red and white) and sized as indicated on the drawings. Submit shop drawing and color samples for approval.

PART 3 – EXECUTION

3.1 COORDINATION

A. The work of this Section shall be performed in full compliance with all approved submittals and certifications, and in conformance with the approved manufacturer's recommendations and requirements.

B. Prior to any demolition or construction, the Manufacturer's representative, the Installer's Foreman, the General Contractor, the Field Owner, and any additional Field Owner designated representatives shall meet to discuss any issues and scheduling.

C. The synthetic turf manufacturer's representative shall inspect all adjacent site conditions and verify that they are in proper condition to receive the work described within this Section. Notify the Engineer of any condition that may potentially affect proper execution of the work. Beginning work of this Section means acceptance of existing substrate surfaces and site conditions.

3.2 DRAINAGE STONE

A. Drainage stone shall be placed as per requirements of Section 312000 Earthwork. To prevent segregation of different aggregate sizes handling of the base stone material shall minimized.

The finished surface of the top drainage stone layer shall be fine graded in preparation of measurement. The contractor shall measure the top drainage stone layer elevations with a laser level to attain the required elevations. Surface tolerance shall not exceed 3/16 inch in ten feet. Infiltration of the Drainage Stone shall be no less than 40 inches per hour (40”/hr). Written approval of the drainage base by the manufacturer’s representative is required prior to installation of the synthetic turf system.

3.3 COMPACTION

A. Compaction Requirements: The degree of compaction as shown on the drawings shall be in accordance with section 312000 Earthwork.

1. Laser grading shall be used in the construction of the stone base material for the Synthetic Turf fields.

B. The contractor shall provide drainage stone testing by a 3rd party for infiltration, planarity and compaction by the approved testing agency.

3.4 SHOCK PAD

A. Protect the shock pad material from direct exposure to sunlight during storage.

B. Install the shock pad in strict accordance with the manufacturer’s recommendations. Shock pad installation shall be completed by the Synthetic Turf Installer and/or by a contractor certified by the approved shock pad manufacturer. An official representative from the shock pad manufacturer shall be present on the site at the commencement of the installation.

C. The synthetic turf and shock pad shall be installed simultaneously. In order to reduce movement or damage, the shock pad shall only be installed as far ahead as 2 turf rolls and shall be completely covered at the end of each work day.

D. As the infill is placed in on top of the turf, secure the shock pad to avoid shifting movement of line markings. Replace or reposition any panels that are shifted or damaged.

3.5 WOVEN SYNTHETIC TURF SYSTEM

A. The accepted synthetic turf system shall be installed in accordance with the manufacturer’s requirements and in coordination with the manufacturer’s representative such that the manufacturer will certify the acceptability of the installation from subgrade to the finished synthetic turf system in writing.

B. Provide all materials, labor and equipment necessary to perform turf installation including, but not limited to, water and rollers to maintain stability and planarity of approved base.

C. After a final inspection of the prepared base by the Field Builder and the Owner's Representative, the synthetic turf installation shall begin. The first roll shall begin with the longest perpendicular cross-field distance. Pile lay shall be in accordance with the approved shop drawings. No head seams shall be permitted.

1. All visible wrinkles shall be stretched out before seaming.

2. Seams shall be flat, tight and permanent with no separation or fraying.

a. Seams shall be glued without bulging in the backing material. Visible seems in the finished installation are not acceptable. Seaming tape shall extend a minimum of 6" in all directions from any material joint

b. The adhesive shall extend at it's full application rate a minimum of 4" in all directions from any material joint.

c. The adhesive shall be applied at the adhesive manufacturers' recommended application rate at 99% efficiency.

d. All seams shall have a min. grab tear strength of 150 lbs and 5% elongation based on ASTM D5034-05.

e. When all rolls of the playing surface have been installed, the sideline areas shall be installed perpendicular to the playing field.

3. Install inlaid field markings to complete the woven markings in accordance with the approved shop drawings and applicable standards.

4. After all seaming and inlaid markings are complete, the plant-based and sand infill shall be spread evenly using a drop spreader or topdresser in accordance with the manufacturers' recommendations.

a. Infill shall be applied in a uniform rate of multiple applications until the required infill depth is achieved.

b. Infill material shall be brushed between infill applications with a motorized rotary broom and pull-type groomer brush simultaneously. Apply layers with a stiff bristle broom to stand fibers up and allow infill to settle into the bottom.

c. A minimum infill rate of 6 lbs. per square foot is required based on a 80/20 blend of plant-based infill to sand.

d. Presence of wrinkles in the synthetic turf and evidence of inadequate ballast will require additional sand.

D. Synthetic Turf Perimeter Attachment:

1. Install approved PVC anchor board to existing concrete edger with approved tapcon screws in pre-drilled holes and approved adhesive. Adhesive shall fully coat the surface of the concrete edger and PVC board, and tapcon screws installed at a maximum of 24-inch spacing.

2. After final trimming of the turf, the turf shall be attached to the PVC anchor board in accordance with the manufacturer's recommendations using mechanical fasteners and adhesive. The edges shall be secure and have a neat and smooth transition to adjacent surface.

3. Complete the infill installation after turf perimeter attachment has been approved by the Landscape Architect.

3.6 SYNTHETIC TURF LAWN

1. Install synthetic turf lawn in accordance with these specifications, the drawings and the manufacturer's recommendations.

    a. Provide all site preparation required to install edging, prepare base and install turf, including but not limited to removal and disposal of existing organic and excess soil.

    b. The accepted synthetic turf system shall be installed in accordance with the manufacturer's requirements and in coordination with the manufacturer's representative such that the manufacturer will certify the acceptability of the installation from subgrade to the finished synthetic turf system in writing.

    c. Provide all materials, labor and equipment necessary to perform turf installation including, but not limited to, water and rollers to maintain stability and shape of approved base.

    d. After a final inspection of the prepared base by the Field Builder and the Owner's Representative, the synthetic turf installation shall begin.

        1) All visible wrinkles shall be stretched out before seaming.

        2) Seams shall be flat, tight and permanent with no separation or fraying.

    e. Seams shall be glued without bulging in the backing material. Visible seems in the finished installation are not acceptable. Seaming tape shall extend a minimum of 6" in all directions from any material joint.

    f. The adhesive shall extend at its full application rate a minimum of 4" in all directions from any material joint.

    g. The adhesive shall be applied at the adhesive manufacturers' recommended application rate at 99% efficiency.

    h. Install inlaid Logo and Text markings in accordance with the approved shop drawings and applicable standards.

    i. After all seaming and inlaid markings are complete, sand infill shall be spread evenly using a drop spreader or topdresser in accordance with the manufacturers' recommendations.

        1) Infill shall be applied in a uniform rate of multiple applications until the required infill depth is achieved.

        2) Infill material shall be brushed between infill applications with a motorized rotary broom and pull-type groomer brush simultaneously. Apply layers with a stiff bristle broom to stand fibers up and allow infill to settle into the bottom.

        3) A minimum infill rate of 5 lbs. per square foot is required.

        4) Presence of wrinkles in the synthetic turf and evidence of inadequate ballast will require additional sand.

j. Synthetic Turf Perimeter Attachment: After final trimming of the turf, the turf shall be attached to the curb in accordance with the manufacturer's recommendations using mechanical fasteners and adhesive. The edges shall be secure and have a neat and smooth transition to adjacent surfaces.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Prior to Owner acceptance of the synthetic turf installation, the Synthetic Turf Manufacturer/Installer shall engage an independent testing agency approved by the Landscape Architect to perform the One Turf Concept testing in accordance with the testing methods referenced herein and according to the Synthetic Turf Council's recommendations.

B. Remove and replace or install additional materials as necessary where test results of measurements indicate non-conforming conditions to specified requirements or industry standards.

3.8 OWNER TRAINING

A. Upon completion of the synthetic turf installation, the synthetic turf manufacturer/installer shall provide training in person for the proper care and maintenance of the synthetic turf system at up to one (1) meetings with the Owner's maintenance personnel. Provide submittals in accordance with Article 1.5 herein.

3.9 CLEANING, REPAIR AND PROTECTION

A. The turf installation contractor shall provide all labor, materials and equipment as required for cleaning, repair and protection of the installation to the satisfaction of the Landscape Architect.

B. Within the first 3 months after final acceptance, the turf installation contractor shall replenish the approved infill material to the required depth at no additional cost to the Owner if the depth of the infill is found to have settled to be less than specified throughout the field surface during that timeframe.

3.10 CLOSEOUT

A. The synthetic turf representative must verify that a qualified representative has inspected the installation and that the finished field surface conforms to the Manufacturer's requirements.

B. The synthetic turf manufacturer shall provide the warranty, training and maintenance manual specified herein.

C. Extra materials: Contractor shall leave specified attic stock, surplus turf pieces of usable size, additional sand and plant-based infill with the Owner.

END OF SECTION

SECTION 323000

SITE IMPROVEMENTS

PART 1 - GENERAL

1.01 General Requirements

A. The conditions of the Contract, including Division 00 and Division 01, apply to the work under this Section.

B. All references to products by manufacturer, trade name or performance Specifications bearing the connotation "or approved equal" shall be as determined by the Landscape Architect and the City.

1.02 Work Includes

A. Provide all labor, equipment, implements and materials required to furnish, install, construct and perform all site improvements complete as shown on the Drawings and specified herein.

B. To be included, but not limited to the following:

1. Granite Blocks

2. Trench Drain Covers at existing track trench drain

3. Trench Drain channel edging

4. Inline Trench Drain Catch Basin Screen

5. Metal Post and Chain Railing

1.03 Related Work

A. Carefully examine all the Contract Documents for requirements that affect the work of this Section. Other specification sections that directly relate to the work of this Section include, but are not limited to the following:

1. Section 02 41 00 – Site Preparation
2. Section 31 20 00 – Earthwork
3. Section 32 12 16 – Asphalt Paving
4. Section 32 13 13 – Concrete
5. Section 32 18 16 – Resilient Sport Surfacing
6. Section 32 18 00 – Synthetic Turf
7. Section 32 90 00 – Planting
8. Section 32 91 00 – Loam and Planting Preparation

1.04 Submittals

A. Shop Drawings and Samples

1. Provide complete material, finish and color information to fully evaluate conformance with the specified requirements for products in this Section. Where products are assemblies or fabrications, provide manufacturer's specifications for all components and hardware.

B. Product Data: Submit manufacturer's technical product data and installation instructions for trench drain materials and products.

1.05 Product Delivery, Storage and Handling

A. Deliver materials in manufacturer's original unopened and undamaged packages with labels legible and intact.

B. Store materials in unopened packages in a manner to prevent damage from the environment and construction operations.

C. Handle in accordance with manufacturer's instructions.

PART 2 - PRODUCTS AND EXECUTION (Combined)

2.01 Granite block

A. Submit representative photos showing size and physical characteristics conforming to these specifications for preliminary approval of stone source. Upon preliminary approval of the stone source, the Landscape Architect will verify in person that there are sufficient stones of acceptable size and quality that the Contractor will then secure for this project.

B. Furnish and install Granite Block seating units in the quantities and locations indicated on the Drawings. Granite Blocks shall have the following characteristics.

1. Granite blocks shall be 20" to 24" in height, 18" to 24" wide and 4'-6" to 7'-0" long. Granite blocks shall be of a uniform size to each other with variations less than 4" from each other.

2. Granite faces shall be flat, split faced. Irregularly rough rock face or angular surfaces are not acceptable. Ends of each piece shall be perpendicular to the vertical face and top such that stones can be placed end-to-end with tight fitting exposed joints.

3. Exposed faces of granite blocks shall be free from oils, tar, asphalt, paint or other stains.

4. Granite blocks shall be reclaimed or newly fabricated units, provided they conform to the requirement listed herein. Sources for granite blocks include:

a. Olde New England Granite, 383 Summer Street, Lynn, MA 781-334-4805, Sales Representative: Bryan

b. Stone Farm Living, 754 Main St, Monroe, CT, 877-977-0004

c. Or and approved equal.

2.02 Trench Drain Replacement Grate Products

A. Furnish and install new trench grate covers. Trench grate covers shall be compatible with the existing trench drain units. The existing trench drain product is supplied by ABT, a Division of Sports Edge, 259 Murdock Road, Troutman, NC 28166, local rep Steve Schuster 412-841-6574.

a. Trench Drain Grate Cover Model#2337BLK, ADA/Heel proof thermoplastic grate
b. Locking Assembly Model#2840.30A
c. Channel Edging Model#2790L FPVC Extruded “L” channel edging, black.

2.03 New Trench Drain Products

A. Furnish and install new trench drain. Meet and match the existing trench drain product as currently installed, product supplied by ABT, a Division of Sports Edge, 259 Murdock Road, Troutman, NC 28166, local rep Steve Schuster 412-841-6574.
   a. Trench Drain Model#2191SE Sports Edge PRO Channel Drain, non-sloping
   b. Locking Assembly Model#2840.30A

2.04 Inline Trench Drain Catch Basin Screen Bucket

A. Furnish and install new inline trench drain catch basin buckets. Inline trench drain catch basin buckets shall be compatible with the existing catch basins installed. As supplied by ABT, a Division of Sports Edge, 259 Murdock Road, Troutman, NC 28166, local rep Steve Schuster 412-841-6574.
   a. Inline trench drain catch basin buckets Model#2905, Stainless Steel Mesh Trash bucket for Catch Basin
   b. First flush filter bags to be installed with each trench drain catch basin bucket, Model#2900FFFB

2.05 Long Jump Sand Catcher Grate

A. Furnish and install new long jump pit sand catcher grates. Sand catch grates shall match and be compatible with the sand catching untits installed. As supplied by ABT, a Division of Sports Edge, 259 Murdock Road, Troutman, NC 28166, local rep Steve Schuster 412-841-6574.
   a. Sand catcher grate Model#SESCG, Sports Edge sand catcher bar grate, aluminum – 36” x 18”

2.06 Steel Post and Chain Railing

A. Furnish and install new fabricated metal post with chain railing as shown on the drawings. Steel pipe and tubing for the metal railing shall be round seamless steel pipe in accordance with ASTM A53/A53M-99B. Sizes shall be as shown on the drawings.

B. Fabrication; as shown or, if not shown:
   a. Match design intent indicated
   b. Meet all codes including barrier free regulations and requirements
   c. Field cut pipe to length and cut chain slot as indicated on the drawings. Grind smooth all cuts and remove all burs and rough edges. Cold galvanize all field cuts and grinds.
   d. Chain shall be 5/16” Grade 30, galvanized chain or as indicated on the drawings
   e. Cap all tops of pipes with compression fit caps.

C. Galvanizing
   a. Steel tubing and associated pipe caps shall be factory galvanized prior to purchase.
   b. Touch-Up and Repair: For damaged coated surfaces, clean welds, bolted connections and abraded areas. At galvanized surfaces, apply organic zinc repair paint complying with requirements of ASTM A780. Galvanizing repair paint shall have 65 percent zinc by weight. Thickness of applied galvanizing repair paint shall be not less than coating thickness required by ASTM A123 or A153 as applicable. Touch-up of galvanized surfaces with aerosol spray, silver paint, bright paint, or aluminum paints is not acceptable.

D. Shop Drawings
    a. The contractor is required to provide detailed shop drawings for all metal fabrications specified herein.
    b. The Contractor shall submit detailed final drawings plans, sections and elevations for approval prior to ordering materials.

E. Installation
    a. Install posts as shown on the drawings. Post to be installed into cored existing concrete walkway and grouted into position with non-shrink mortar. Chain shall be installed within the locking slot in the post. Chain shall be continuous and not cut between each post, excess chain to be stored inside tube. Install compression fit cap over each post and full set cap down to chain.

2.07 Cleaning, Repair and Protection

A. Repair minor damage to eliminate all evidence of repair with comparable materials. Remove and replace work that cannot be satisfactorily repaired.

B. Upon completion of the work and before acceptance, the Contractor shall remove and dispose of in an approved manner all surplus materials, rubbish, etc. which the Contractor may have accumulated during the course of the work and shall leave the site in a clean and orderly condition. The Contractor shall not abandon any material at or near the site regardless of whether or not it has any value.

END OF SECTION

SECTION 329000

PLANTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 apply to the work of this Section.

1.02 DESCRIPTION OF WORK

A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to perform all planting work and related items as indicated on the Contract Documents and as specified in this Section and includes, but is not limited to, the following:

1. Planting shrubs, groundcovers
2. Planting maintenance
3. One-year plant guarantee period for all plants
4. Inspection and acceptance
5. Cleaning and protection

1.03 RELATED WORK

A. Carefully examine the site and all of the Contract Documents for requirements that affect the work of this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions. Other specifications sections that directly relate to the work of this Section include, but are not limited to, the following:

1. Section 02 41 00 – Site Preparation
2. Section 31 20 00 - Earthwork
3. Section 32 12 136– Asphalt paving
4. Section 32 13 13 – Concrete
5. Section 32 18 16 – Resilient Sport Surfacing
6. Section 32 18 00 – Synthetic Turf
7. Section 32 30 00 – Site Improvements
8. Section 32 91 00 – Loam and Planting Preparation

B. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work, as necessary to assure the steady progress of all work of the Contract.

1. The planting subcontractor shall become fully acquainted with the nature and requirements of the project including the location of all underground utilities prior to starting the work of this Section.

1.04 REFERENCES

A. The following standards shall apply to the work on this Section.

1. American National Standards Institute (ANSI):
2. Z60.1 American Standard for Nursery Stock, latest edition, published by American Association of Nurserymen, (AAN).

1.05 SUBMITTALS

A. Material Samples and testing:

B. Provide full analysis of existing on-site loam, and off-site loam source from a laboratory that has been approved in writing by the Architect. Sampling and testing shall be as specified, and performed under the work of Section 32 91 00 Loam and Planting Soil Preparation.

C. Planting mulch: submit one gallon-sized Ziploc bag.

D. Provide manufacturers' certified analysis for soil amendments and fertilizers.

1.06 REGULATORY REQUIREMENTS

A. Strictly comply with all applicable codes, regulations and requirements having jurisdiction.

B. All fertilizer and pesticide applications shall be performed by a licensed applicator in strict conformance with all local, state and federal regulations. Notify the Owner's Project Representative at least two (2) weeks prior to scheduled date of application.

1.07 QUALITY ASSURANCE

A. Subcontract planting work to a single landscape construction company specializing in this work. All work will be performed by experienced landscape professionals familiar with planting procedures and under the full-time supervision of a qualified foreman. The General Contractor shall notify the Architect in writing upon the selection of a landscape subcontractor and arrange for a pre-construction meeting between the Architect, General Contractor, and Subcontractor. Such meeting shall seek to establish the proposed schedule, source of plants, consideration of substitutions and general review of procedures.

B. Inspection of Plant Materials: Plant materials are subject to inspection and approval upon delivery to the project site. Certificates of inspection of plant material shall be furnished as may be required by Federal, State and other authorities. No plants shall be planted until required inspections have been made and the plants approved.

C. Label at least one shrub of each species within each plant grouping with a securely attached waterproof tag bearing legible designation of botanical and common name.

1.08 PLANTING SEASONS

A. Complete landscaping work as quickly as possible as portions of the site become available for this work. Work only within seasonal limitations for proper planting as follows:

Type of Plant Material	Spring Season	Fall Season
Evergreen Shrubs	April 15 to June 1	Aug. 15 to Oct. 1
Deciduous Shrubs	Shall be planted in a dormant condition.	

B. Planting performed outside of these seasonal limitations will not be accepted unless approval is obtained in writing from the Architect. Any approved work outside of these seasonal limitations pertains only to the work to be performed in the season of the year requested.

1.09 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in manufacturer's original unopened containers showing weight, analysis and name of manufacturer. Comply with manufacturer's

instructions and recommendations for storage and handling. Protect all materials from damage, deterioration, injury and theft while stored at the site.

1.10 EXAMINATION OF CONDITIONS

A. All areas to be planted shall be inspected by the General Contractor prior to starting work and any incorrect grading or inadequate drainage shall be reported to the Architect prior to beginning work.

PART 2 - PRODUCTS

2.01 LOAM

A. Loam for planting shall be approved, specified, provided, and installed under the work of Section 32 91 00, Loam and Planting Preparation, and that has been pH adjusted according to particular planting applications and improved through the addition of organic material as directed under this Section.

B. Planting loam mix for groundcover, planting shall have a pH value of 5.5 to 6.5, which has been thoroughly premixed with organic material in the proportions of one part organic matter (humus or compost), with 5 parts of approved loam. Organic material shall be specified, provided, and installed under Section 32 91 00, Loam and Planting Preparation.

2.02 SOIL ADDITIVES

A. Soil additives shall be specified, provided, and installed under the work of Section 32 91 00 Loam and Planting Preparation.

B. For trees/shrubs planted late in the season after October 1st (or any transplant)

C. Use Granular Mycorrhizal inoculant product for plant establishment per manufacturer recommendation. Mycor Tree Saver Transplant as manufactured by Plant Health Care Inc, Pittsburgh PA, or approved equal as determined by Landscape Architect.

D. NutriPak slow-release tree and shrub fertilizer in two strengths – 1-2 years (fruit trees) and 3-5 years (hardwood). Apply as directed by the manufacturer.

2.03 STANDARD OF PLANTS

A. The General Contractor shall furnish all plants shown on the Contract Documents. No substitutions will be permitted, without written approval by the Landscape Architect. Furnish plants which have been nursery grown in accordance with the American Standard for Nursery Stock of the American Nursery and Landscape Association (ANLA) and ANSI Z60.1 - latest edition, and which have been grown under climate conditions similar to those in the locality of the project. All plants shall conform to the varieties, sizes and quantities specified on the plans and typical of their species. They shall be free from insects, insect eggs, scale and/or disease. The root system of each shall be well provided with fibrous roots. Plants shall have a sound, healthy, well-formed upper growth with straight trunks, well-branched and densely foliated when in leaf. Plants shall be legibly tagged with its proper name for purposes of identification of plant material during planting.

1. Measurements: Height and spread dimensions specified refer to the main body of the plant and not from branch or root tip to tip.

2. Plants larger than specified in the plant list may be used if approved by the Architect, but use of such plants shall not increase the contract price. If the use of larger plants is approved, the spread of roots or ball of earth shall be increased in proportion to the size of the plant.

2.04 BARK MULCH

A. Bark Mulch: for planting beds shall be a 100% pine bark product free from lumps, dirt, or deleterious materials. Bark shall be substantially free from wood fibers. No pieces of bark shall exceed three (3) inches in any dimension, or be thicker than 1/4 inch. Mulch shall have been aged for a minimum of six months, and not longer than two years. Bark shall be no more than two years old. All plant beds shall receive a two to four inch layer of mulch, not to exceed four inches.

2.05 WATER

A. Water: shall be furnished by the General Contractor from a legal off-site source via water truck and be suitable for irrigation, free of toxic ingredients. Sources of water at or near the site that are made available to the General Contractor are a convenience to the General Contractor. Limitations of site water sources shall be supplemented by off-site sources at the General Contractor's expense to meet the maintenance requirements of this Section. Any municipal fees associated with providing water for this work shall be borne by the General Contractor.

1. Watering Equipment: The General Contractor shall furnish sufficient watering equipment to distribute water evenly with complete coverage daily to all seeded areas.

2.06 ANTIDESICCANTS

A. Antidesiccants (as required based on planting conditions) shall be emulsions or other materials which will provide a protective film over plant surfaces permeable enough to permit transpiration and specifically manufactured for that purpose. Antidesiccant shall be "Wilt-Pruf" available from Nursery Specialty Products, Inc., New York, N.Y. or approved equal, and mixed and applied according to the manufacturer's instructions.

PART 3 - EXECUTION

3.01 PLANTING

A. All plant roots and earth balls must be kept damp and thoroughly protected from sun and drying winds at all times from the beginning of the digging operation, during transportation, and on the ground until the final operation of planting.

B. Prior to spreading loam, subgrades shall have been tested to determine if they are too compact to drain water as specified.

C. Plant material Selection: at least one month prior to the expected planting date, the General Contractor shall request that the Landscape Architect select and tag plants to be planted as specified.

1. The General Contractor shall be responsible to certify the availability of quality plants in specified sizes from his/her sources of supply prior to requesting that the Landscape Architect make plant source inspections. In the event that plants at the inspection location are found to be unavailable or of insufficient size, the General Contractor shall be liable to reimburse the Owner for all costs of the Landscape Architect's hourly services which are incurred during unproductive inspection trips.

2. Unless specifically designated otherwise, a representative of the General Contractor shall accompany the Landscape Architect on all plant material selection field trips.

3. Representative samples only of shrubs, perennials and groundcover plants may be tagged or marked for approval as an "Approved Typical Sample" and shipped to the site. Any shrub or groundcover plant that arrives at the construction site that does not meet the Approved Typical Sample will be rejected by the Landscape Architect.

4. Inspection and approval of plants at the source shall not impair the right of subsequent inspection and rejection upon delivery to the site, or during the progress of the work if the Landscape Architect finds that plants do not meet the requirements of the PLANT LIST or this Contract, have declined noticeably due to handling abuse, lack of maintenance, or other causes. Cost of replacements, as required, shall be borne by the General Contractor.

D. General Contractor shall located all existing underground utilities of the proposed planting and notify the Architect of any conflicts prior to digging.

E. Locations for all plants shall be staked-out on the ground and approved by the Architect before any excavation is made. Adjustments in locations shall be made as directed by the Architect. Planting shall be in accordance with the planting details on the Drawings.

F. The General Contractor shall take special care to insure that the plant material is not planted too deeply by removing burlap and soil mounded around the base of the plant, at the top of the rootball, to expose the trunk flare. A measurement shall be taken from the trunk flare to the bottom of the root ball. This measurement shall be the depth of the planting hole.

G. The plants shall be set at the center of the holes with trunk flare level to, or 1 in. – 2 in. above, finish grade. Once plant is set in planting pit, the General Contractor shall remove the top 12 in. minimum, of wire basket and all visible rope and burlap.

H. Hole shall be backfilled in layers of loam not more than nine inches and each layer watered sufficiently to settle before the next layer is put into place. Do not place any subsoil, sod or waste materials in planting hole.

I. Each shrub shall be pruned in accordance with National Arborist Association Standards to preserve the natural character of the plant. Remove all tags, labels and dead or broken branches.

J. A 2 – 4 in. settled layer of bark mulch shall be applied over the entire area of the plant beds. Plantings installed over three months prior to the date of substantial completion shall be weeded and replenished with fresh mulch to specified thickness prior to acceptance.

K. Provide a soil saucer equal to the diameter of the hole around each plant. Particular attention shall be made to create saucers at sloped areas that contain water around the base of the plant. Soil saucers shall be repaired and maintained as needed to perform effectively during the maintenance period.

L. Plants shall be watered at a rate of 3–5 gallons twice within the first twenty-four (24) hours of the time of planting.

3.02 MAINTENANCE

A. Shrubs, Groundcover Plantings:

1. The General Contractor shall maintain plantings until the date of substantial completion or until the date of acceptance, whichever is later.

2. Maintenance shall begin immediately after each plant is planted and shall include watering, weeding, pruning, pest control, removal of dead materials and otherwise maintaining plants. Correct defective work as soon as possible after it becomes apparent and weather and season permit. Reset settled plants to proper grade and position, restore planting saucer, and remove dead material. Repair soil saucers around trees and replenish bark mulch to meet the specified thickness as needed throughout the maintenance period.

3. Watering: The General Contractor shall include in his base bid costs for weekly watering of all plant areas for the entire first growing season. The required watering frequency will vary depending on temperature and natural rainfall. The General Contractor shall respond to adverse weather conditions in a timely manner to maintain the moisture level in the soil necessary for proper plant establishment. Plants shall be watered at a rate of 3-5 gallons per plant. Slow release watering bags shall be filled weekly during this period. Plants subjected to drought stress during the required maintenance period may become unacceptable as determined by the Architect and require replacement at no additional cost to the Owner.

4. Anti-desiccant: Treat plants subject to desiccation at the time of planting and again prior to winter according to the manufacturer's recommendations.

5. During the maintenance period, any decline in the condition of plantings shall require the General Contractor to take immediate action to identify potential problems and undertake corrective measures. If required, the General Contractor shall engage professional arborists and/or horticulturalists to inspect plant materials and to identify problems and recommend corrective procedures. The Landscape Architect shall be immediately advised of such actions. Inspection and recommendation reports shall be submitted to the Architect.

3.03 ACCEPTANCE

A. Upon completion of planting work per Construction Phase, the General Contractor shall request in writing that the Landscape Architect formally inspect the planting work. The General Contractor, Owner, and landscape Architect shall walk all areas of completion to determine date of turnover to the Owner.

B. Following the correction of all Punch List deficiencies, the General Contractor shall request in writing that the Landscape Architect formally inspect the planting work. If plant materials and workmanship are acceptable, the Landscape Architect will issue a written Certificate of Final Acceptance to the General Contractor.

3.04 PLANT GUARANTEE

A. The date of the Certificate of Final Acceptance shall establish the commencement of the required one-year guarantee and establishment period for planting work.

B. At the end of the guarantee and establishment period, a final inspection will be held to determine whether any plant material replacements are required. Plants found to be unacceptable shall be removed promptly from the site and replaced.

C. All replacements shall be plants of the same kind and size originally specified. The cost shall be borne by the General Contractor, except for possible replacements due to vandalism or neglect on the part of others.

3.05 CLEANING AND PROTECTION

A. During operations, keep pavements clean and work area in an orderly condition. Protect all plantings from damage by other contractors and trades and trespassers. After completion of the work, the General Contractor shall remove all debris, materials, rubbish, excess dirt, etc. from the site and dispose of them in a legal manner. The premises shall be left clean and presentable to the satisfaction of the Architect.

END OF SECTION

SECTION 329100

LOAM AND PLANTING PREPARATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 apply to the work of this Section.

1.02 DESCRIPTION OF WORK

A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to perform all lawns, plantings and related work as indicated on the Contract Documents and as specified in this Section and includes, but is not limited to, the following:

1. Subgrade preparations
2. Stripping existing topsoil and planting soil material acquisition
3. Testing and analysis for specification conformance
4. Preparation of mixes and testing for conformance
5. Mock Up
6. Installation and placement of soils
7. Fine grading
8. De-compaction and re-compaction of soils
9. Final in-place testing of soils
    1) Coordination with other contractors
    2) Inspection and acceptance
10. Cleaning and protection

1.03 RELATED WORK

A. Carefully examine the site and all of the Contract Documents for requirements that affect the work of this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions. Other specifications sections that directly relate to the work of this Section include, but are not limited to, the following:

1. Section 02 41 00 - Site Preparation
2. Section 31 20 00 – Earthwork
3. Section 31 13 13 – Asphalt paving
4. Section 32 13 13 – Concrete
5. Section 32 18 16 – Resilient Sport Surfacing
6. Section 32 18 23 – Synthetic Turf
7. Section 32 30 00 – Site Improvements
8. Section 32 90 00 – Planting

B. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work, as necessary to assure the steady progress of all work of the Contract.

1.04 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. D 75 Practice for Sampling Aggregates
2. D 422 Test Method for Particle-Size Analysis of Soils
3. D698-00a Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3)
4. D1557 Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10-lb rammer and 18-in. drop

B. A.O.A.C.: Association of Official Agricultural Chemists.

1.05 SUBMITTALS

A. At least 30 days prior to ordering materials, the Contractor shall submit to the Architect representative samples, certifications, manufacturer's product data and certified test results for materials as specified below. No materials shall be ordered or delivered until the required submittals have been reviewed and approved by the Architect. Delivered materials shall closely match the approved samples. Approval shall not constitute final acceptance. The Architect reserves the right to reject, on or after delivery, any material that does not meet these Specifications.

B. Existing On-Site loam: Sample and test existing on-site loam. The Contractor shall sample the existing loam soils of the construction site in the following manner:

1. The Contractor shall provide a one gallon representative sample of the on-site stockpile of existing loam for testing. All stockpile sampling shall be per ASTM D 75 and Appendixes for securing samples from stockpiles.

C. Loam from off-site, if on-site loam is insufficient: The Contractor shall provide a one gallong representative sample per each 1,000 cubic yard proposed stockpile of loam borrow for testing. All stockpile sampling shall be per ASTM D 75 and Appendixes for securing samples from stockpiles.

D. Testing shall be at the Contractor's expense. Contractor shall deliver all samples to testing laboratories via overnight courier and shall have the testing report sent directly to the Architect. Perform all tests for gradation, organic content, soil chemistry and pH by UMASS Soil and Plant Tissue Laboratory, West Experiment Station, 203 Paige Laboratory, 161 Holdsworth Way, Amherst, MA 01003, (413) 545-2311. Testing reports shall include the following tests and recommendations.

1. Mechanical gradation (sieve analysis) shall be performed and compared to the USDA Soil Classification System.
2. Percent of organics shall be determined by the loss on ignition of oven-dried samples. Test samples minus #10 material shall be oven-dried to a constant weight at a temperature of 450 degrees Fahrenheit (752 degrees Centigrade).
3. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, extractable Aluminum, Lead, Zinc, Cadmium, Copper, Soluble Salts, and pH and buffer pH. A Conductivity Meter shall be used to measure Soluble Salts in 1:2 soil/water (v/v). Except where otherwise noted, nutrient tests shall be for available nutrients.

4. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish lawn and planting work as specified.

E. In-Place Testing

1. Density Tests: ASTM D1556 Density of soil and rock in place using “Sand Cone Method" or ASTM D6938-08a Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth). ASTM D698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort. (Standard Proctor).

1) In-place density tests shall be carried out at a rate of one test per each plant bed or lawn area.

2) Soil density shall meet the requirements specified herein, see PART 3.

2. As required, in-place infiltration tests shall be performed using Turf-Tec IN2-W Infiltrometer utilizing manufacturer's operating instructions, or accepted alternate.

3. At the direction of the Landscape Architect in-place planting soil blends shall be sampled and tested by the Owner for compliance with gradation and organic matter content as specified herein. Non-compliant materials shall be removed from the site or amended as specified.

F. Compost: Submit supplier's certification of contents being supplied conforms to these Specifications.

G. Limestone: Submit supplier’s certification that the limestone being supplied conforms to these Specifications.

H. Acidulant: Submit supplier’s certification that the acidulant being supplied conforms to these Specifications.

I. Fertilizer:

1. Submit product data of seeding/sodding fertilizer and certificates showing composition and analysis. Submit fertilization rates for fertilizer product based upon soil testing, analysis, and recommendations as specified, performed and paid for under in this Section.

J. Gypsum: Submit manufacturer’s product data.

1.06 REGULATORY REQUIREMENTS

A. Strictly comply with all applicable codes, regulations and requirements having jurisdiction.

B. All fertilizer applications shall be performed by a licensed applicator in strict conformance with all local, state and federal regulations. Notify the Owner’s Project Representative at least two (2) weeks prior to scheduled date of application.

1.07 EXAMINATION OF CONDITIONS

A. The Contractor and any sub-Contractor responsible for the execution of the Work of this Section, shall review the subgrades and elevations to verify that the subgrades have been prepared as required by the Contract Documents, prior to proceeding with the spreading of the planting loam. Carefully review the requirements of this Section, to understand the requirements of percolation testing, compaction, slope and absence of debris of the subgrade prior to spreading of the loam borrow.

B. The Contractor shall be solely responsible for judging the full extent of work requirements involved, including but not limited to sampling and testing of all materials prior to final planting installation.

1.08 DEFINITIONS/QUALITY ASSURANCE

A. The following definitions shall apply to the work of this Section.

1. The following size distributions of mineral particles by diameter and sieve size shall apply to the following conventional names of soil types:

Conventional Name	Retained on U.S. Sieve No.	Diameter (mm)
Very coarse sand	#18	1 - 2
Coarse sand	#35	0.5 - 1
Medium sand	#60	0.25 - 0.5
Fine sand	#140	0.10 - 0.25
Very fine sand	#270	0.05 - 0.10
Silt	by hydrometer	0.002 - 0.05
Clay	by hydrometer	Less than 0.002

2. Subgrade: Soil material and levels resulting from the approved rough grading work.

3. Existing Topsoil: In place soil at planted areas that will be stripped, screened and amended and re-used as a component of manufactured soil blends.

4. Imported Base Loam: Base Loam obtained by an approved soil supplier for off-site manufacture of soil blends to be imported to the project site.

5. Planting Soils: Planting Soils are composed of a blend of three base components: base loam or stripped topsoil, organic material and sand. The quality of the blend depends on the quality of the original components. Locate and obtain approval of sources for base loam, organic material and sand that meet the Specification requirements. Contractor is then responsible for mixing the components. Approximate mixing ratios are provided, but may require adjustment, depending on the final materials and with the approval of the Architect or their representative, in order to meet Specification requirements for each blend.

B. Contractor is solely responsible for quality control of the Work.

C. The installer shall be a firm having at least 5 years of successful experience of a scope similar to that required for the Work, including the preparation, mixing and installation of custom Planting Soil and planting mixes in urban locations.

1. The installing contractor shall be the same firm that is installing planting as described in Section 329000 – PLANTING.

2. Installer Field Supervision: Installer to maintain an experienced full-time supervisor on Project site when any Planting Soil preparation work is in progress.

3. The installer's crew shall be experienced in the installation of soil, grading and interpretation of grading plans in urban areas.

D. Soil work shall be performed by a firm that has sufficient earthwork machinery at the job site simultaneously to amply provide for the vigorous execution of the site work without interruption or delay, except for unforeseen circumstances, such as weather. Machinery operators shall be well experienced in this type of work.

E. Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.

F. Comply with all requirements for control of silt and sediment during soil installation work as indicated in the contract documents. Provide additional silt and sediment control to maintain silt and sediments within the working area as required by the progress of the work or as directed by the Landscape Architect

G. Pre-installation Conference: Conduct conference at project site prior to the start of any work related to Planting Soil preparation and shall meet the requirements of this Section.

H. Layout and Grading:

1. Permanent benchmarks shall be established by a registered land surveyor or professional civil engineer, at the Contractor's expense. The Contractor shall maintain established bounds and benchmarks and replace them, if any are destroyed or disturbed.

2. The Contractor shall maintain at the site, sufficient surveying equipment to accurately excavate to the required subgrade and install soil to the required finish grade. The Contractor shall be responsible to install soil profiles at the elevations and thickness shown on the Plans.

PART 2 - PRODUCTS

2.01 LOAM

A. Loam: The Contractor shall provide additional loam as necessary to complete the work of this Section from off-site sources if there is not sufficient material on site suitable to complete the Work. The Contractor shall submit samples and an analysis from each proposed source of material. Provide loam that is fertile, friable, natural loam reasonably free from subsoil, clay lumps, glass, brush, litter, roots, stones and other foreign materials.

B. Loam shall be one of the following sandy loams; "coarse sandy loam", or "sandy loam" determined by mechanical analysis ASTM D-422 and based on the USDA Classification System, and as defined in this Section. It shall be uniform in composition, without admixture of subsoil. It shall be free of stones greater than one and one-quarter inches, lumps, plants and their roots, debris and other extraneous matter, such as glass, brick, metals, plastics, etc. as determined by the Landscape Architect.

1. Loam for trees, shrubs, groundcover and vines, and perennials shall have the following grain size distribution for material passing the #10 (2.0 mm) sieve:

US Sieve No.	Percent Passing by Weight	
	Minimum	Maximum
10	100	
18	85	95
35	60	85
60	42	65
140	21	44
270	18	24
0.02	2	4

1) The final mix shall have an organic content between 5 and 7 percent by weight.

2) pH shall be between 5.5 and 6.5.

3) Gravel in the loam mix shall be <10%.

4) The ratio of the particle size for 80% passing (D80) to the particle size for 30% passing (D30) shall be 6 or less (D80/D30 <6)

5) The final mix shall have a hydraulic conductivity of not less that 1.5 inches per according to test procedure ASTM D5856-95 (2000) hour when compacted to a minimum of 86 percent Standard Proctor ASTM D 698. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.

C. Organic content: loam shall contain not less than 6% or more than 10% organic (unless specified differently herein) matter of the sample that passes a 1/4" sieve when determined by the wet combustion method on a sample dried at 105 degrees.

1. Loam borrow shall be pH adjusted for particular planting applications and shall be adjusted prior to delivery to the Project sites as recommended by UMASS Soil & Plant Tissue Laboratory test results.

1) When pH of loam borrow is equal to or greater than 7 use aluminum sulfate to adjust pH downward to required levels.

2) When pH of loam borrow is less than 7 use either sulfur or ferrous sulfate to adjust pH downward to required levels.

3) When pH of loam borrow must be raised to the required levels use limestone.

4) Regardless of amendment Contractor chooses to use, Contractor, not the Owner, shall be responsible for obtaining specified pH by seeding and/or planting time.

D. Loam shall be uncontaminated by salt water, foreign matter and substances harmful to plant growth. Topsoil shall not have levels of extractable aluminum greater than 200 parts per million except for acid-loving plants. Cation Exchange Capacity (CEC) shall be between 10 and 15.

E. All planting loam provided from off-site sources shall be brought to the site meeting all specification requirements. There must be no mixing or amending of soil on site. The loam borrow must not be handled or moved when in a wet or frozen condition.

F. Screened loam which has been stockpiled on the site may be used provided it can be made to comply with this Specification and that it has been screened to meet the above requirements.

G. To assure planting loam purchased and screened loam stockpiled fulfills specified requirements regarding textural analysis, organic matter content, and pH, soil testing results shall be obtained by the Contractor and submitted to the Architect for approval before any soil is delivered to the site.

2.02 SOIL ADDITIVES

A. Soil additives shall be used to counteract soil deficiencies as recommended by the soils analysis.

B. Lime: Provide approved agricultural limestone containing not less than 85% of total carbonates with a minimum of 30% magnesium carbonates. Lime shall meet Massachusetts Department of Food and Agriculture standards for Fine-Sized Classification so that 50% passes a 100 mesh, 60% passes through a 60-mesh sieve, and 95% will pass a 20 mesh sieve.

C. Aluminum Sulfate shall be unadulterated, 57% (Ortho Division, Chevron Chemical Company), or approved equal.

D. Compost: Provide compost as needed to raise the Organic Content of the topsoil to within specified range. Compost shall be:

1. Compost shall be derived from organic wastes including sawdust, clean ground wood, leaf and yard residues, and biosolids that meet all State Environmental Protection Agency requirements. The product shall be well composted, free of viable weed seeds and contain material of a generally humus nature capable of sustaining growth of vegetation, with no materials toxic to plant growth. The material shall be fully composted and to have maintained a temperature above 55 degrees Centigrade or 131 degrees Fahrenheit for at least 15 days per EPA/40 CFR Part 503. The composted material shall have a moisture content such that no visible free water or dust is produced when handling the material. Submit complete product analysis including: Organic Nitrogen, Carbon/Nitrogen Ratio, Total Phosphorous, Total Potassium, Organic Matter, pH, particle size and product density.

2. Compost products shall meet the following physical criteria:

Parameters	Range
pH	5.5 – 8.0
Moisture Content	35% - 55%
C:N ratio	15 – 30:1
Organic Matter	> 40%
Particle Size	< 3/4”
Soluble Salts	< 4.0 mmhos (ds)
Bulk Density	< 1200 lbs/cuyd
Foreign Matter	< 1% by weight
Solvita Maturity Rating	5 - 7

3. Acceptance of composted products shall be based on the following submittals by the Contractor:

1) A request for Approval of a Material Source.

2) A copy of the Composting Permit for the Material Source selected.

3) Certification by the supplier that the compost product meets state EPA guidelines and that it originates from 100 percent recycled vegetation material that has been aerobically composted.

E. Medium to Coarse Sand

1. Sand for Planting Soil Blends, protection of filter fabric and for drainage as required, shall be uniformly graded medium to coarse sand consisting of clean, inert, rounded to sub-angular grains of quartz or other durable rock free from loam or clay, mica, surface coatings and deleterious materials with the following grain size distribution for material passing the #10 sieve: Washed concrete sand typically meets Specification Requirements.

	Percent Passing	
U.S. Sieve Size Number	Minimum	Maximum
10	100	--
18	60	80
35	25	45
60	8	20
140	0	8
270	0	3
0.002mm	0	0.5

1. Maximum size shall be one-inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample.
2. The ratio of the particle size for 70% passing (D_{70}) to the particle size for 20% passing (D_{20}) shall be 2.8 or less (D_{70}/D_{20} <2.8). Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422.
3. pH shall be less than 7.5

F. Humus shall be natural humus. It shall be free from excessive amounts of zinc, low in wood content, free from hard lumps and in a shredded or granular form. According to the methods of testing of the Association of Official Agricultural Chemists, latest edition, the acidity range shall be approximately 5.5 pH to 7.5 pH and the organic matter shall be not less than 85% as determined by loss on ignition. The minimum water absorbing ability shall be 200% by weight on an oven-dry basis.

G. Bone meal shall be fine ground, steam cooked, packing house bone with a minimum analysis of 23% phosphoric acid and 4% nitrogen.

H. Fertilizers: Commercial fertilizer shall be a complete fertilizer complying with all State and Federal Fertilizer laws. Fifty-percent of available nitrogen shall be in a slow-release form as is found in certain urea-form products, or natural organic forms, or a combination of both. The salt index of the fertilizer shall not exceed 35. It shall contain the following percentages by weight.

		Lawns
Nitrogen	(N)	10%
Phosphorus	(P)	10%
Potash	(K)	10%

I. Fertilizer shall be delivered and mixed as specified, in standard size unopened containers, showing weight, analysis in compliance with Massachusetts Department of Food and Agriculture regulations, and name of manufacturer. It shall be stored in a weatherproof storage place, in such a manner that it will be kept dry, and its effectiveness not impaired.

1. Fertilizer for planting shall be formulated for top-dressing, soil surface application to plants. Fertilizer shall be designed and certified by the manufacturer to provide controlled release of fertilizer continuously for not less than 9 months. One hundred percent of the nitrogen content shall be derived from organic materials. Nitrogen source shall be coated to ensure slow release. Fertilizer percentages of weight of ingredients shall be as recommended by the soil testing and analysis specified, performed, and paid for under this Section, Loam and Planting Preparation.

J. Gypsum ($CaSO_4 \cdot 2H_2O$) shall be agricultural grade, granular form. Gradation shall conform to the following:

Sieve Designation	Percent Passing by Weight
No. 8 (2.36 mm)	100
No. 16 (1.18 mm)	97
No. 30 (0.60 mm)	82
No. 50 (0.30 mm)	46
No. 100 (0.15 mm)	21

PART 3 - EXECUTION

3.01 FILLING AND COMPACTION

A. Perform percolation tests on existing subsoils or placed fill prior to placing and spreading loam for planting:

1. Perform percolation testing of subsoil or placed fills to determine whether or not the subgrade will drain properly. Perform percolation tests as specified in this Section.
2. In the event that percolation testing indicates that the subsoil, placed fills or ordinary borrow has been over compacted and will not drain, the contractor shall loosen up the top 12” inches of the subgrade to be planted, seeded, or sodded by ripping or other mechanical means. Recompact the borrow by driving a small, tracked bulldozer over the area at low speeds so that the tracks of the bulldozer pass over the affected area and the soil is compacted to a density that will percolate as specified under the work of this Section. Under no circumstances shall wheeled vehicles be driven over subsoil, placed fills or ordinary borrow that have been shown to percolate or subsoil, placed fills or ordinary borrow that has been loosened and shown to percolate.
3. Perform sufficient percolation tests in areas of poorly draining or compacted subsoil or compacted placed fills as directed by the Architect to ensure that these underlying soils drain. Likewise, perform sufficient percolation tests after ripping and loosening to ensure that the soils are no longer too compact to drain.

B. Subsoil or ordinary borrow shall have been excavated and filled as required by the Contract Documents. Do not damage the work previously installed. Maintain all required angles of repose of materials adjacent to the loam as shown on the Contract Documents. Do not over excavate compacted subgrades of adjacent pavement or structures during loaming operations.

C. Confirm that the subgrade is at the proper elevation and that no further earthwork is required to bring the subgrade to proper elevations. Subgrade elevations shall slope parallel to the finished grade and or toward any subsurface drain lines as shown on the Contract Documents. Provide a written report to the Architect that the subgrade has been placed to the required elevations and that the subgrade drains water at the rates specified under the required percolation tests specified, performed and paid for under this Section, Loam and Planting Preparation. Perform no work of placing and spreading loam until elevations have been confirmed and written report has been accepted by the Architect.

D. Clear the subgrade of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout or other material harmful to plants have been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Such construction debris, trash, rubble and foreign material shall be removed from the site and disposed of in a legal manner. Fill any over excavation with approved fill and compact to the required subgrade compaction levels.

E. Do not proceed with the installation of loam until all utility work in the area has been installed.

F. Protect adjacent walls, walks and utilities from damage or staining by the loam. Use 0.5-inch plywood and or plastic sheeting to cover existing concrete, metal and masonry work and other items as directed during the progress of the work. Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day.

3.02 FINE GRADING

A. Finish grades associated with the grading of the athletic field areas shall be performed with laser-guided grading equipment to meet the tolerances required by the Drawings and Specifications. Before spreading loam or infield mix material, the Contractor shall furnish and install grade stakes sufficiently spaced to insure correct line and grade of the finished subgrade. The Contractor shall verify elevations and do whatever additional grading is necessary to bring the subgrade layer to a true, smooth slope parallel to the finish grade for all areas to receive loam.

B. Immediately prior to dumping and spreading loam, the subgrade shall be in a friable condition, as described herein, cleaned of all stones greater than 2 inches and all debris or rubbish. Such material shall be removed from the site, not raked to the edges and buried. Notify the Architect that the subsoil has been cleaned and request his/her attendance on site to review and approve subgrade conditions prior to spreading loam borrow.

C. Loam borrow delivered to the site shall be protected from erosion at all times. Materials shall be spread immediately. Otherwise, materials that set on site for more than 24 hours shall be covered with tarpaulin or other soil erosion system acceptable to the Architect and surrounded by silt fence.

D. No loam borrow shall be handled, planted, or seeded in any way if it is in a wet or frozen condition. A moist loam borrow is desirable.

E. Soil additives shall be spread and thoroughly incorporated into the layer of loam by harrowing or other methods reviewed by the Architect. The following soil additives shall be incorporated:

1. Ground limestone or acidulant as required by soil analysis to achieve the required pH as described in this Section. Spread limestone at the rate required by soil analysis up to a maximum limit of 200 pounds per 1,000 square feet. Should recommendations of soil analysis require greater rates of application than 200 pounds per 1,000 square feet, a surface application of limestone not in excess of 50 pounds per 1,000 square feet shall be made to the established lawn during the season after Final Acceptance. This second application of limestone shall be performed and paid for under the work of Section 32 92 00, Turf and Grasses, at rates determined under the testing requirements of this Section, Loam and Planting Preparation.
2. Fertilize at the rate recommended by the soil analysis. For lawn areas, this fertilizer application shall be the first in a series of fertilizer applications made under this Contract and shall be applied and incorporated under this Section, Loam and Planting Preparation. A second and third application of fertilizer for turf areas shall be specified, spread and paid for under Section 32 92 00 Turf and Grasses, of this Specification. For planting areas this fertilizer application shall be primary application and the process of application described under Section 32 90 00, Planting of this Specification and specified, provided, performed and paid for under this Section, Loam and Planting Preparation.
3. Humus, compost, sand or other soil amendments as required by soil analysis.

F. Loam shall be sampled and tested as specified, performed and paid for under the work of this Section, to verify application and incorporation of limestone, fertilizer and other soil amendments.

G. After loam and required additives have been spread, carefully prepare the loam by scarifying, harrowing, or tilling the loam to integrate soil additives into the top 6 inches of the loam. Remove all large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter. Remove from unscreened soils all stones over 3/4 inch in diameter from the top 6 inches of the loam bed. Loam shall also be free of smaller stones in excessive quantities as determined by the Architect and as specified herein.

H. Sufficient grade stakes shall be set for checking the finished grades. Stakes must be set in the bottom of swales and at the top of slopes. Deviation from indicated elevations that are greater than one-tenth of a foot shall not be permitted. Connect contours and spot elevations with an even slope. Finish grades shall be smooth and continuous with no abrupt changes at the top or bottom of slopes.

I. During the compaction process, all depressions caused by settlement or rolling shall be filled with additional loam and the surface shall be regraded and rolled until presenting a smooth and even finish corresponding to the required grades.

J. The Contractor shall install loam in successive horizontal lifts no thicker than 12 inches in plant bed areas to the desired compaction as described herein. The Contractor shall install the soil at a higher level to anticipate any reduction of loam borrow volume due to compaction, settling, erosion, decomposition, and other similar processes during the warranty period. The Architect will ensure that the full depths of loam for lawn and plant beds are obtained by digging holes in the loam at the same frequency as for compaction testing.

1. Compact loam to the required density as specified.
2. Maximum dry density for loam shall be determined in accordance with ASTM D698. The following percentages of minimum to maximum dry densities shall be achieved for fill materials or prepared subgrades.

In lawn, plant beds and tree pits:

	Minimum	Maximum
Planting areas in top eighteen inches of finished grade	82%	85%
Lawn Areas in top eight inches of finished grade	84	86%

3. The surface area of each lift shall be scarified by raking prior to placing the next lift. Soils shall not be compacted with vibratory equipment.

K. In addition to the range cited above, compact each lift sufficiently to reduce settling but not enough to prevent the movement of water and feeder roots through the soil. The loam borrow in each lift should feel firm to the foot in all areas and make only slight heel prints. At completion of the loam borrow installation, the soil should offer a firm, even resistance when a soil sampling tube is inserted from lift to lift. After the placement of each lift, perform percolation tests to determine if the soil has been over compacted. Perform the following percolation test procedure:

1. Dig a hole in the installed soil that is a minimum of 4 inches in diameter. Holes in 6-inch lift in turf areas shall be 4 inches deep. Holes in 12-inch lifts in plant beds shall be 8 inches deep. Do not penetrate through the lift being tested.
2. Fill the hole with water and let it drain completely. Immediately refill the hole with water and measure the rate of fall in the water level.
3. In the event that the water drains at a rate less than one inch per hour, till the soil to a depth required to break the over compaction.
4. Perform a minimum of one soil percolation test per 10,000 square feet area of turf area and 2,500 square feet of tree and shrub planting area as directed by the Architect.

L. Select equipment and otherwise phase the installation of the loam to ensure that wheeled equipment does not travel over subsoil, placed fills or ordinary borrow or already installed soil. Movement of tracked equipment over said soils will be reviewed and considered for approval by the Architect. If it is determined by the Architect that wheeled equipment must travel over already installed soil, provide a written description of sequencing of work that ensures that compacted soil is loosened and uncompacted as the work progresses or place one-inch thick steel plate ballast (or equivalent ballast approved by the Architect) over the length and width of any travel way to cover loam borrow to protect it from compaction.

M. Disturbed areas outside the limit of lawn work shall be graded smooth and spread with a minimum of 6 inches of loam to the finished grade.

N. Contractor shall be responsible for maintaining all stockpiles of existing, on-site loam on the site until final placement of all loam has been approved by the Architect in writing. No loam shall be removed from the site unless approved by the Architect in writing. Upon written approval by the Architect, Contractor shall remove all excess, unused existing on-site loam from the site and dispose of it in a legal manner.

3.03 PROTECTION

A. The Contractor shall protect landscape work and materials from damage due to landscape operations, operations by other Contractors or trespassers. Maintain protection during installation until acceptance. Treat, repair or replace damaged Planting Soil installation work immediately.

B. Provide all means necessary, including fences, to protect all soil areas from compaction and contamination by trash, dust, debris, and any toxic material harmful to plants or humans after placement. Any area that becomes compacted, shall be de-compacted and tilled to the extent determined by the soil scientist and recompressed to the density ranges specified. Any uneven or settled areas shall be filled, re-graded and re-compacted to meet the requirements of this Specification. Soil that becomes contaminated shall be removed and replaced with specified soil material.

C. Phase the installation of the planting soil such that equipment does not have to travel over already installed planting soil. Use of haul roads is acceptable provided that the haul road is completely re-worked to meet the requirements of this Specification. Under no circumstances shall heavy equipment or trucks be allowed to traverse placed topsoil or prepared subgrade unless said equipment is tracked or has low ground pressure tires.

D. Apply filter fabric covering and planking or other engineering controls over soil to minimize compaction and collect dust and debris in any area where the Contractor must work after the installation of Planting Soil.

E. Till compacted Planting Soil and replace Planting Soil that has become contaminated as determined by the Landscape Architect. Planting Soil shall be tilled or replaced by the Contractor at no expense to the Owner.

3.04 ACCEPTANCE/POST INSTALLATION TESTING

A. Confirm that the final grade of the loam borrow is at the proper finish grade elevations. Adjust grade as required to meet the contours and spot elevations noted on the Plans. Request the presence of the Architect to inspect final grade. Do not proceed with the remaining work of this Contract until the Architect has given his/her written approval of the final grade.

B. Placed Planting Soils must be capable of infiltrating water at the minimum rate provided in this Specification for each type of planting soil

END OF SECTION

APPENDIX - A

EXISTING FIELD-TESTING DOCUMENTS

ON-SITE TESTING
BS EN 12616 PERMEABILITY

Project Information

Project Name	Dilboy Stadium BS EN 12616:2013 Permeability Evaluation BS EN 1969:2000 Infill Depths		
Client Info	Warner Larson Landscape Architects 130 West Broadway Boston, MA 02127	**Site Info**	Dilboy Stadium 110 Alewife Brook Pkwy Somerville, MA 02144
Report Date	5/26/2020	**Test Date**	5/21/2020
Report Status	Final	**Job No.**	95657/6031s
Prepared by	*Michael Rocheleau* *Field Operations Manager*		Michael J Rocheleau
Checked By	*Jeffrey Gentile* *Operations Director*		

Notes:

1. This report has been prepared by Firefly Sports Testing with all reasonable skill, care and diligence within the terms of the contract with the Client and within the limitations of the resources devoted to it.

2. This report is confidential to the Client and Firefly Sports Testing accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known. Any such party relies upon the report at their own risk.

3. This report shall not be used for engineering or contractual purposes unless signed by the Author and the Checker and unless the report status is "Final."

Summary

Firefly Sports Testing was commissioned to perform permeability testing. The purpose of this testing was to provide permeability rates for the tested surface. The tests performed were per the following standard:

Test Type	Test Method	Test Description
Infiltration	**EN 12616: 2013**	Surfaces for sports areas - Determination of water infiltration rate test.
Infill Depths	**EN 1969:2000**	Surfaces for Sports Areas – Determination of Thickness of Synthetic Sports Surfaces

APPENDIX - A
EXISTING FIELD TESTING DOCUMENTS

LABORATORY TESTING
INFILL IDENTIFICATION

Project Information

Project Name	Dilboy Stadium Infill Identification	**Sample Collection Date**	5/21/2020
Client Information	Warner Larson Landscape Architects 130 West Broadway Boston, MA 02127		
Report Date	6/2/2020	**Test Date**	5/27/2020 - 5/29/2020
Report Status	Final		
Job No.	95657/6031s		
Prepared by	*Megan Illsley* *Laboratory Director*		
Checked By	*Jeffrey Gentile* *Director of Operations*		

Notes:

1. This report has been prepared by Firefly Sports Testing with all reasonable skill, care and diligence within the terms of the contract with the Client and within the limitations of the resources devoted to it.

2. This report is confidential to the Client and Firefly Sports Testing accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known. Any such party relies upon the report at their own risk.

3. This report shall not be used for engineering or contractual purposes unless signed by the Author and the Checker and unless the report status is "Final."

Summary

Firefly Sports Testing was commissioned to perform infill identification testing. Infill samples were collected from the site by a Firefly Sports Testing technician. The test performed were per the standard listed below.

Test Type	Test Method	Test Description
Particle Size	**EN 933-1:2012**	Tests for Geometrical Properties of Aggregates – Part 1: Determination of Particles Size Distribution – Sieving Method

Table Contents

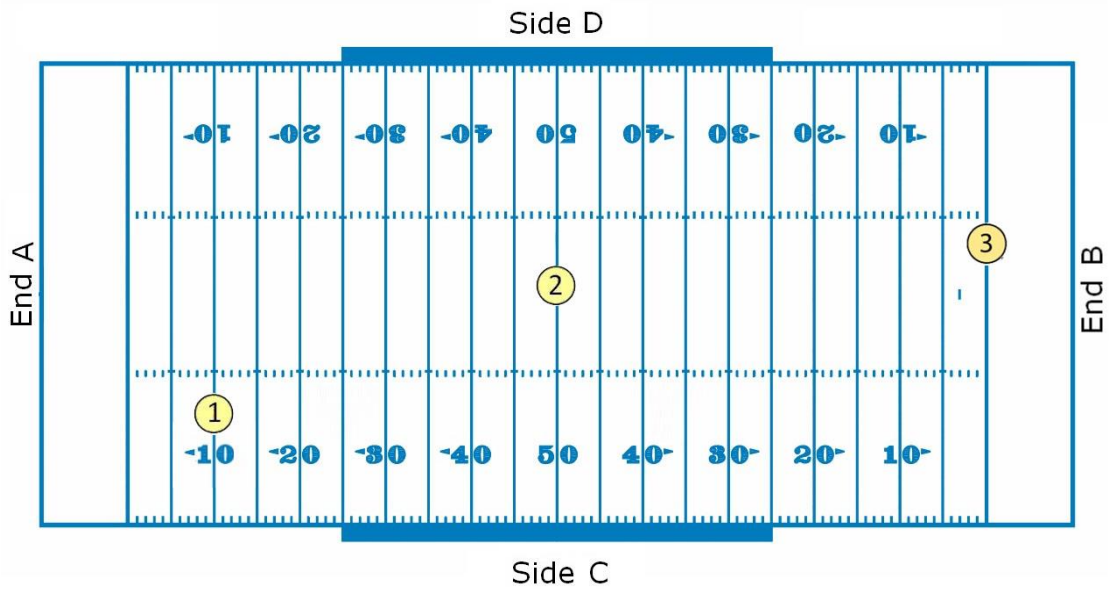
APPENDIX - A
EXISTING FIELD TESTING DOCUMENTS

LABORATORY TESTING
INFILL IDENTIFICATION

General Information

Test Methods	**EN 933-1** Test for geometrical properties of aggregates- Part 1: Determination of particle size distribution- sieving method		
Test Date	5/27/2020-5/29/2020	**Material**	SBR and Sand
Weather Conditions	Indoor	**Air Temp (° F)**	72
Humidity %	45	**Misc. Notes**	End A = North

Collection Locations

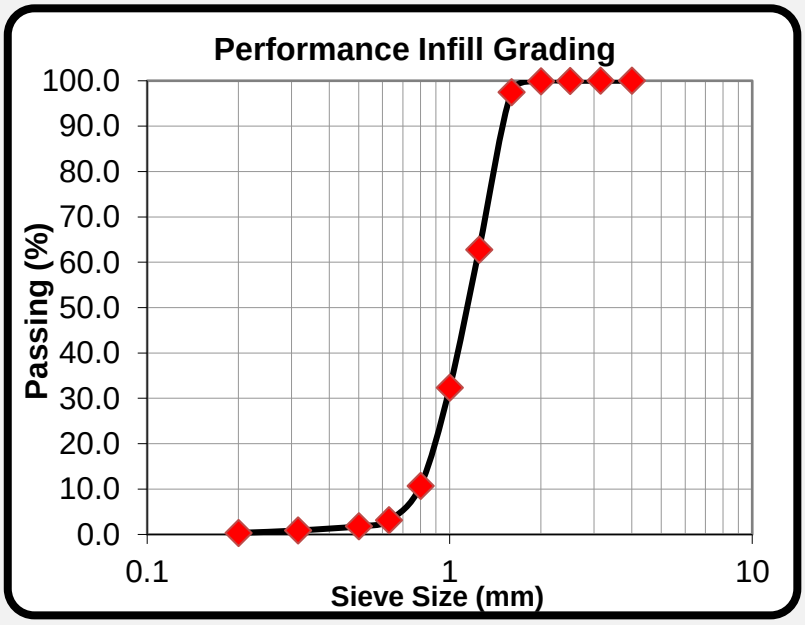


Infill Ratios

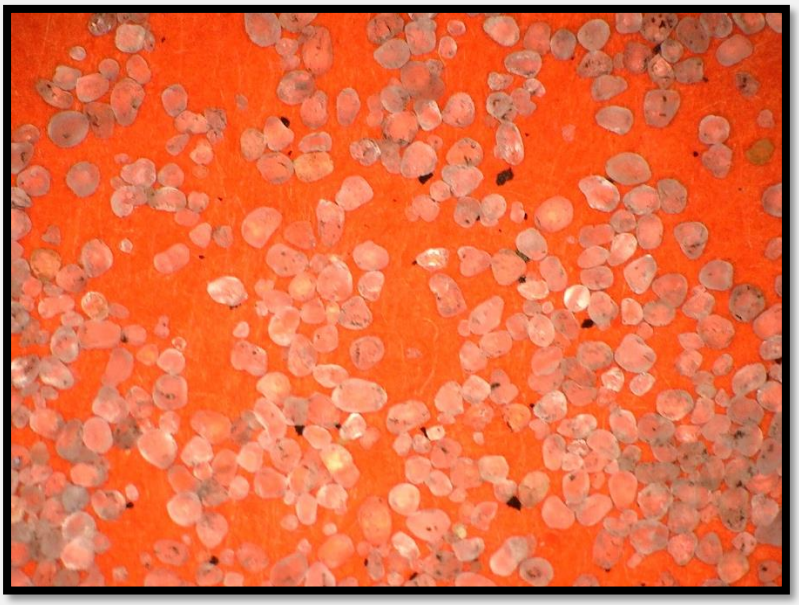
	Infill Depth (mm)	Performance Infill (SBR) %	Stabilizing Infill (Sand) %	Performance Infill (SBR) lbs/ft²	Stabilizing Infill (Sand) lbs/ft²
Location # 1	33	55.7	44.3	2.597	2.063
Location # 2	34	51.7	48.3	2.351	2.199
Location # 3	33	50.4	49.6	2.512	2.476

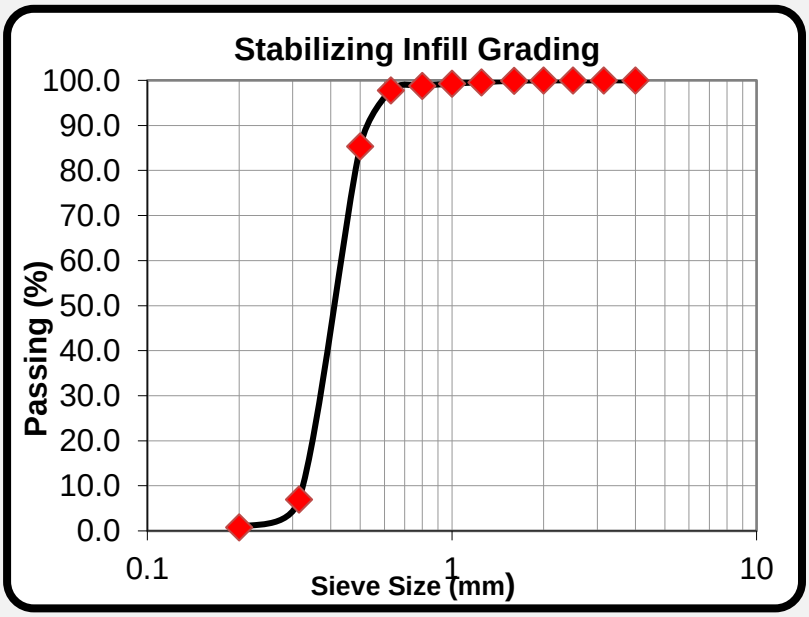
Infill Grading

Particle Size Distribution for RUBBER LOCATION 1	
SIEVE SIZE (mm)	**Passing (%)**
4.00	100.0
3.15	100.0
2.50	100.0
2.000	99.9
1.600	97.5
1.250	62.8
1.000	32.3
0.800	10.7
0.630	3.1
0.500	1.8
0.315	0.9
0.200	0.3
Passing to base tray	0.1



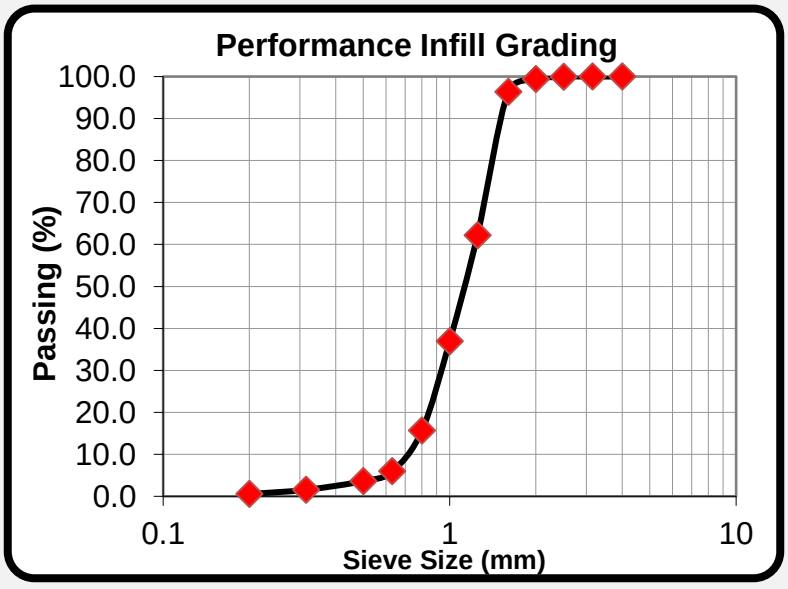
Particle Size Distribution for SAND LOCATION 1	
SIEVE SIZE (mm)	**Passing (%)**
4.00	100.0
3.15	100.0
2.50	100.0
2.000	100.0
1.600	99.9
1.250	99.6
1.000	99.2
0.800	98.8
0.630	97.8
0.500	85.4
0.315	7.0
0.200	0.8
Passing to base tray	0.1





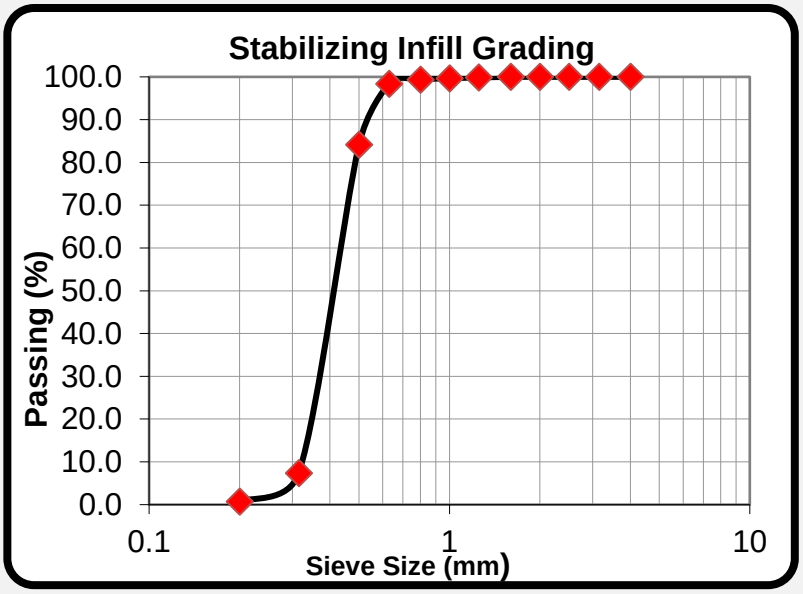
APPENDIX - A
EXISTING FIELD TESTING DOCUMENTS

Particle Size Distribution for RUBBER LOCATION 2	
SIEVE SIZE (mm)	**Passing (%)**
4.00	100.0
3.15	100.0
2.50	99.9
2.000	99.4
1.600	96.3
1.250	62.2
1.000	36.9
0.800	15.6
0.630	5.9
0.500	3.6
0.315	1.6
0.200	0.5
Passing to base tray	0.1

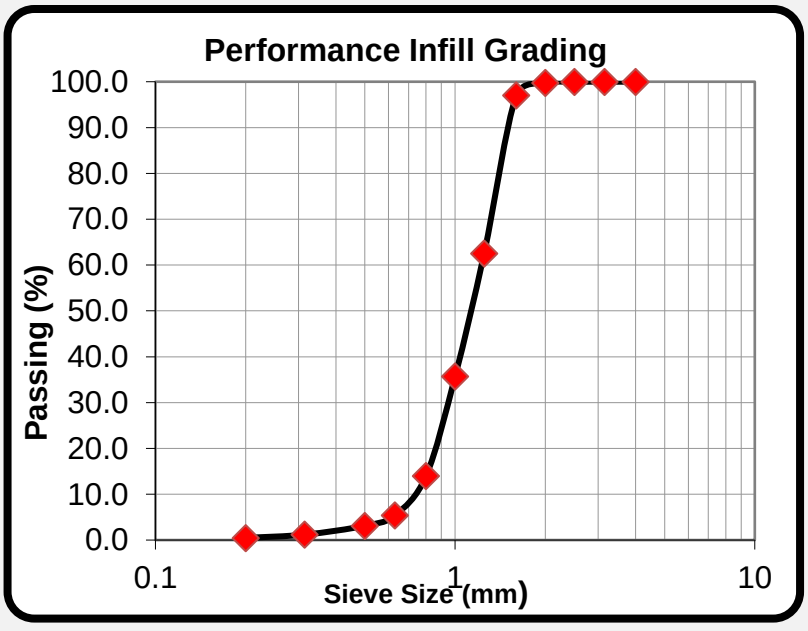


APPENDIX - A
EXISTING FIELD TESTING DOCUMENTS

Particle Size Distribution for SAND LOCATION 2	
SIEVE SIZE (mm)	Passing (%)
4.00	100.0
3.15	100.0
2.50	100.0
2.000	100.0
1.600	100.0
1.250	99.9
1.000	99.7
0.800	99.4
0.630	98.4
0.500	84.2
0.315	7.4
0.200	0.7
Passing to base tray	0.1

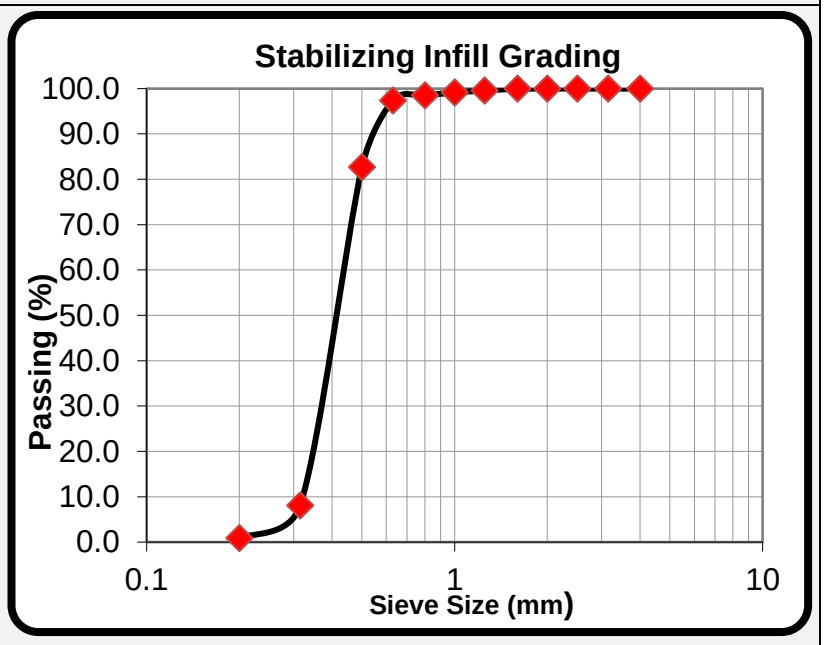


Particle Size Distribution for RUBBER LOCATION 3	
SIEVE SIZE (mm)	Passing (%)
4.00	100.0
3.15	100.0
2.50	100.0
2.000	99.8
1.600	97.0
1.250	62.5
1.000	35.7
0.800	14.0
0.630	5.4
0.500	3.1
0.315	1.2
0.200	0.5
Passing to base tray	0.0



APPENDIX - A
EXISTING FIELD TESTING DOCUMENTS

Particle Size Distribution for SAND LOCATION 3	
SIEVE SIZE (mm)	**Passing (%)**
4.00	100.0
3.15	100.0
2.50	100.0
2.000	100.0
1.600	100.0
1.250	99.6
1.000	99.1
0.800	98.5
0.630	97.4
0.500	82.7
0.315	8.1
0.200	0.9
Passing to base tray	0.1



End of Report

APPENDIX - A
EXISTING FIELD TESTING DOCUMENTS

Quick Reference Results Summary

	Average	Range (min)		(max)
Infiltration Rate (in/hr)	*59*	*45*	*to*	*73*
Infill Depths (mm)	*35*	*30*	*to*	*40*

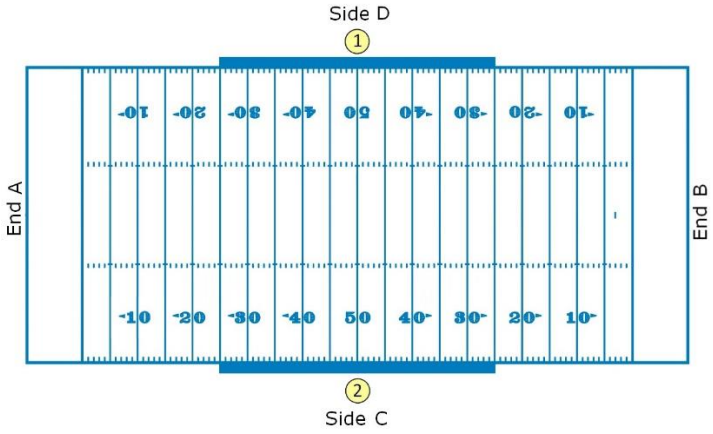
Table Contents

Overall Picture

General Information

Device	Double Ring Infiltrometer		**Test Methods**	BS EN 12616:2013 Method C
Method of Seal	Contact		**Date of Construction:**	n/p
Test Date:	5/21/2020		**Carpet Type:**	3G
Test Condition:	Dry		**Infill Type:**	SBR and Sand
Substrate Type:	Aggregate		**Shockpad:**	None
Surface Name:	n/a		**Weather Conditions:**	Clear & Sunny
Time of day	AM	PM	**Wind Speed: (m/s)**	4.47
Air temp: (ºF)	70	n/a	**Uncertainty Measurement:**	±50mm/hr
Surface temp: (ºF)	83	n/a	**Operator:**	MR
Humidity: %	24	n/a	**Water Temp: (ºF)**	60
Field Orientation	End A =	North	**Misc Field Notes**	Turf was cut open and infiltration was performed on the base

Permeability Location Map



Results Table

Location	Permeability Rate (in/hr)
Location #1	73
Location #2	45

Location Photos

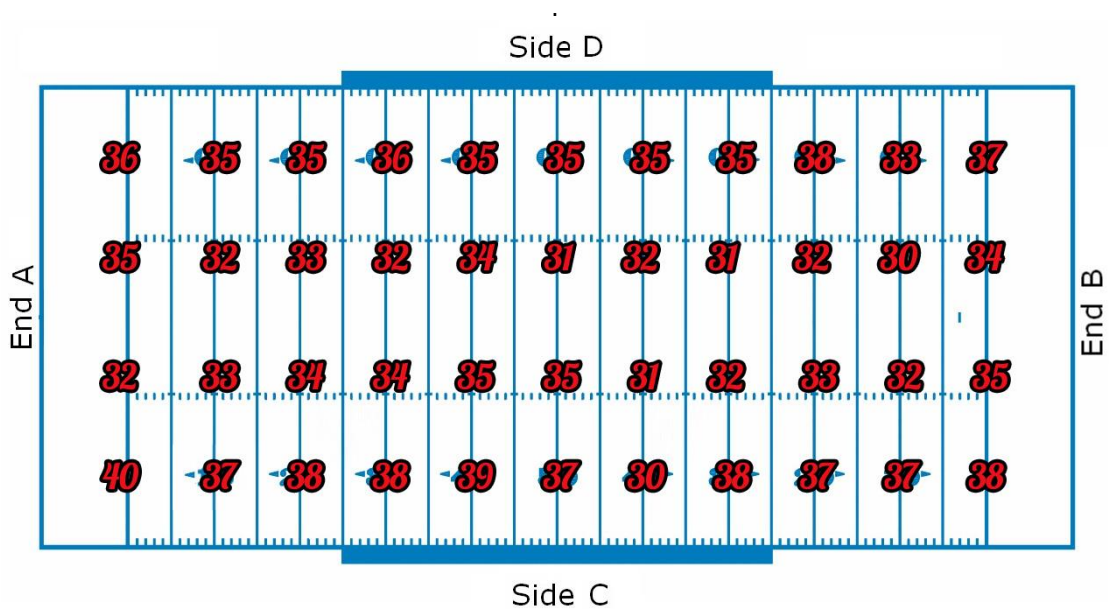
Photos have been taken at each location and are displayed in sequence below.

Location #1

Location #2

Infill Depths

44 infill depths were taken across the entire field of play. Please refer to map below for relative location and depth recorded in millimeters



End of Report